



# TM 5-3825-223-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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RETURN TO GPO: 1964 O-570-1

OPERATOR AND ORGANIZATIONAL  
MAINTENANCE MANUAL

DISTRIBUTOR, WATER, TANK TYPE, 1000 GAL CAPACITY  
GASOLINE DRIVEN, TRUCK MOUNTED  
(GENERAL STEEL TANK MODEL 1602)  
FSN 3825-403-9334

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This copy is a reprint which includes current  
pages from Changes 1 through 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 JULY 1970



## **WARNING**

When the engine is operated in a closed area, pipe the exhaust gases outside. The exhaust gases contain carbon monoxide which is colorless, odorless, and deadly poison.

Do not smoke or permit an open flame within 50 feet of the equipment when handling or storing fuel.

Stop the engine when performing any work around the flywheel or drive shaft.

Do not touch the exhaust manifold, muffler, or exhaust line during operation of the engine or before they have cooled. A severe burn could result.

Do not operate the engine while filling the fuel tank.

Provide a metallic contact between the filling device and the fuel tank, to prevent a static spark which would ignite the fuel vapors.

Depress emergency magneto ground button before working on engine.

Keep the operator's platform free of obstructions.

When welding a fuel tank make sure that the tank has been properly steam cleaned or is filled with water.

Changes in force: C 1, C 2, and C 3

TM 5-3825-223-12  
C 3

CHANGE }  
No. 3 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 17 September 1973

**Operator's and Organizational  
Maintenance and Manual  
DISTRIBUTOR, WATER, TANK TYPE, 1000 GAL CAPACITY,  
GASOLINE DRIVEN, TRUCK MOUNTED  
(GENERAL STEEL TANK MODEL 1602)  
FSN 3825-403-9334  
FSN 3825-407-0406**

TM 5-3825-223-12, 1 July 1970, is changed as follows:

Page i. Appendix C title is changed as follows:  
BASIC ISSUE ITEMS LIST AND ITEMS TROOP  
INSTALLED OR AUTHORIZED.

Page 1-1. So much of paragraph 1-2b that reads

"U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP" should read "US Army Troop Support Command, ATTN: AMSTS-MPP."

Page 2-1. Paragraphs 2-1e is added as follows:  
e. For maintenance and operating supplies see table 2-1.

Table 2-1. Maintenance and Operating Supplies

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for 8 hrs operation	(6) Notes
0101 CRANK-CASE (1)	9150-265-9435 (2)	OIL, LUBRICATING: 5 gal pails as follows: OE-30	5qt		(1) Includes quantity of oil to fill engine oil system as follows: 4 qt — Crankcase 1 qt — Oil Filter  (2) See FSC C9100-IL for additional data and requisitioning procedures.
	9150-265-9428 (2)	OE-10	5qt		
	9150-242-7603 (2)	OES	5qt		
			1/2qt		
0304 CLEANER (4)		OIL, LUBRICATING (4)			(3) See current LO for grade application and replenishment intervals  (4) Use oil as prescribed in item 1.
0306 FUEL TANK	9130-160-1818	Fuel, Gasoline: Bulk as follows: Automotive, Combat 91A	50gal		
	9130-160-1830	Automotive, Combat 91C	50gal		
PIPE AND THREAD COMPOUND	8030-201-0996	Sealing Compound Spec FEDTT-A-580	1pt		

## APPENDIX C BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

### Section I. INTRODUCTION

#### C-1. Scope

This appendix lists basic issue items and items troop installed or authorized which accompany the water distributor and are required by the crew/operator for operation, installation, or operator's maintenance.

#### C-2. General

This basic issue items and items troop installed or authorized list is divided into the following sections:

*a. Basic Issue Items List — Section II.* Not applicable.

*b. Items Troop Installed or Authorized List — Section III.* A list in alphabetical sequence of items which, at the discretion of the unit commander, may accompany the end item, but are not subject to be turned in with the end item.

#### C-3. Explanation of Columns

The following provides an explanation of the

columns in the tabular list of items troop installed or authorized, section III.

*a. Source, Maintenance, and Recoverability Code(s) (SMR):* Not applicable.

*b. Federal Stock Number.* This column indicates the Federal stock number assigned to the item which will be used for requisitioning purposes.

*c. Description.* This column indicates the Federal item name and any additional description of the item required.

*d. Unit of Measure (U/M).* A 2-character alphabetical abbreviation indicating the amount or quantity of the item upon which the allowances are based; e.g., ft, ea, pr; etc.

*e. Quantity Authorized.* This column indicates the quantity of the item authorized to be used with the equipment.

### Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock number	(3) Description	(4) Unit of meas	(5) Qty auth
	4210-889-2221	EXTINGUISHER, FIRE	ea	1

By Order of the Secretary of the Army:

Official:

**VERNE L. BOWERS**  
*Major General, United States Army*  
*The Adjutant General*

**CREIGHTON W. ABRAMS**  
*General, United States Army*  
*Chief of Staff*

Distribution:

To be distributed in accordance with DA Form 12-25B, (qty rqr block No. 377) Operator Maintenance Requirements for Distributors, Water.

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D. C., 24 February 1972

**Operator and Organizational  
Maintenance Manual**

**DISTRIBUTOR, WATER, TANK TYPE, 1000 GAL. CAPACITY,  
GASOLINE DRIVEN, TRUCK MOUNTED  
(GENERAL STEEL TANK MODEL 1602)**

**FSN 3825-403-9334**

**FSN 3825-407-0406**

TM 5-3825-223-12, 1 July 1970, is changed as follows:

*Cover and page i.* Federal Stock Number 3825-407-0406 is added to the title as shown above.

*Page ii, List of Illustrations.* The caption of figure 1-3 "Wiring diagram" is changed to read "Wiring diagram for units mounted on truck chassis M61A2"

*Page ii, List of Illustration.* The following is added to the list of illustrations in proper numerical order.

*Figure 1-4.* Wiring diagram for units mounted on truck chassis M810.

*Figure 4-5.* Fuel tank removal.

*Figure 4-5.1.* Fuel tank, lines and fittings.

*Figure 4-6.1.* Muffler removal and installation.

*Figure 4-6.2.* Exhaust pipes, removal and installation.

*Figure 4-6.3.* Muffler disassembly and reassembly.

*Figure 4-7.1.* Carburetor disassembly and reassembly.

*Figure 4-22.1.* Bed access step.

*Page 1-2, figure 1-1.* The label "M61A2 TRUCK CHASSIS" is changed to read "TRUCK CHASSIS"

*Page 1-3, figure 1-2.* The label "M61A2 TRUCK CHASSIS" is changed to read "TRUCK CHASSIS".

*Page 1-4, paragraph 1-4 b. (1).* In line 3, "77-01 through 77-85" is changed to read "77-001 through 77-087".

*Page 1-4, Paragraph 1-4 b. (6)* is superseded as follows:

(6) Wiring Diagrams. Refer to figures 1-3 and 1-4.

*Page 1-4, Paragraph 1-5* is superseded as follows:

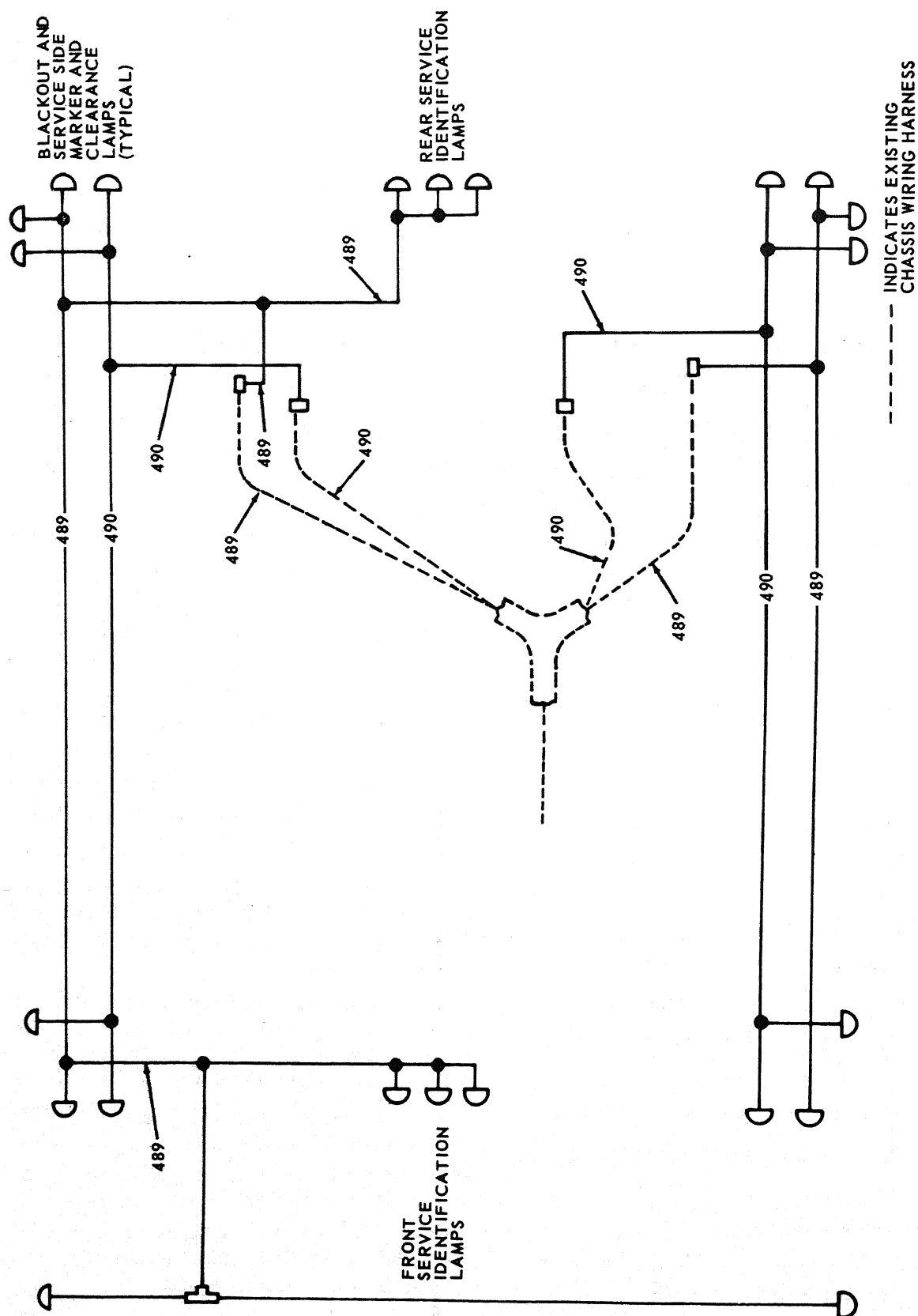
1-5. Differences in Models.

This publication provides instructions for the Model 1602 Water Distributor, serial numbers 77-001 through 77-087, as manufactured by General Steel Tank Company.

a. Units mounted on truck chassis M61A2 are serial numbers 77-001 through 77-043; 77-045 through 77-050 and 77-052; 77-056 through 77-060, 77-063, 77-064, 77-067, 77-068, and 77-072.

b. Units mounted on truck chassis M810 are serial numbers 77-044, 77-051, 77-053 through 77-055, 77-061, 77-065, and 77-066; 77-069 through 77-071; 77-073 through 77-087.

*Page 1-5, figure 1-3.* The caption "Wiring diagram" is changed to read "Wiring diagram for units mounted on truck chassis M61A2".



**Figure 1-4. Wiring diagram for units mounted on truck chassis M810.**

ME 3825-223-12/1.4 C?

*Page C-2, Section II.* In line 1, column (2), "2540-796-1712" is changed to read "2540-670-2459"

*In line 13, Column(2),* "5120-072-0715" is changed to read "5120-595-8396"

By Order of the Secretary of the Army:

Official:

VERNE L. BOWERS,  
*Major General, United States Army,  
The Adjutant General.*

W. C. WESTMORELAND,  
*General, United States Army,  
Chief of Staff.*

Distribution:

To be distributed in accordance with DA Form 12-25B, (qty rqr block No. 377) operator maintenance requirements for Distributors, Water.

CHANGE

NO. 1

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D. C., 24 June 1971

**Operator and Organizational**

**Maintenance Manual**

**DISTRIBUTOR, WATER, TANK TYPE, 1000 GAL CAPACITY**

**GASOLINE DRIVEN, TRUCK MOUNTED**

**(GENERAL STEEL TANK MODEL 1602)**

**FSN 3825-403-9334**

TM 5-3825-223-12, 1 July 1970, is changed as follows:

*Page 2 of cover.* In the sentence reading "Depress emergency magneto ground button before working on engine", delete the word "emergency".

After the last sentence, add the following:

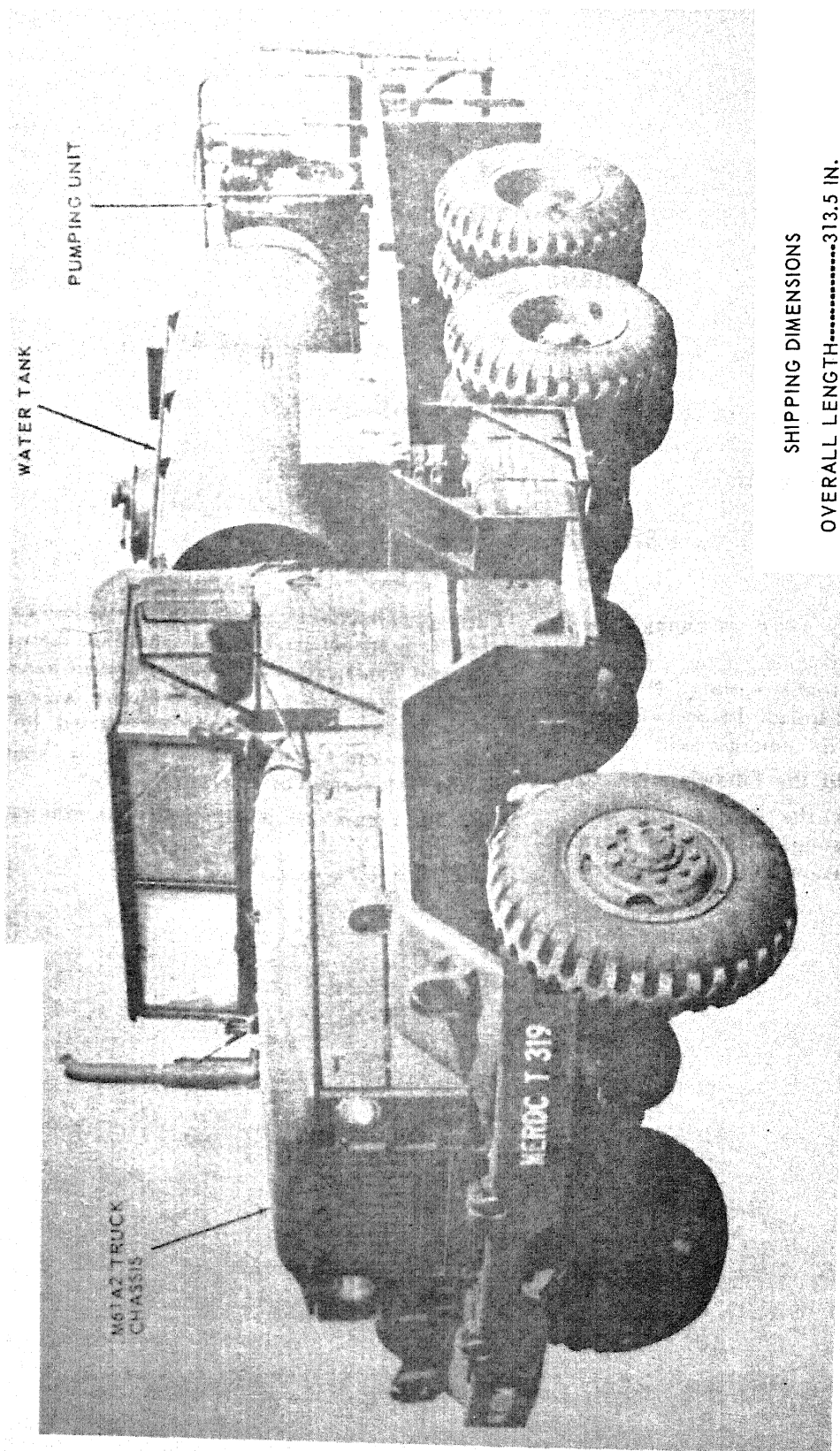
"Do not attempt to start the engine with the handcrank. There is not enough clearance to turn the handcrank a full revolution and the operator's hand will be injured."

"Turn spray bar take-up crank slowly when raising or lowering spraybar. Limited clearance between crank and hand rail may cause injury to hands."

*Page 1-1, paragraph 1-3 c.* The sentence beginning on line 5 that reads, "It may be started by an electric starter or a manual handcrank", is changed to read, "It is started by an electric starter".

*Page 1-2.* Figure 1-1 is superseded as follows:





#### SHIPPING DIMENSIONS

OVERALL LENGTH.....313.5 IN.  
 OVERALL HEIGHT.....108 IN.  
 OVERALL WIDTH.....98.75 IN.  
 SHIPPING CUBAGE.....1936 CU. FT.  
 SHIPPING WEIGHT.....20,050 LBS.  
 SHIPPING TONNAGE.....14 SHIP TONS (WATER)

ME 3825-223-12/1-1 C1

Figure 1-1. Model 1602 Water Distributor, left front view.

Page 1-4. Paragraph 1-4 b (5) is superseded as follows:

(5) *Dimensions and weights.*

Overall length.....	313.5 inches
Overall width.....	98.75 inches
Overall height.....	108 inches
Net weight empty.....	20,050 pounds
Net weight filled.....	28,383 pounds
Shipping volume.....	1936 cu. ft.
Shipping weight.....	20,050 pounds

Page 2-2. Paragraph 2-81 is superseded as follows:

### WARNING

Do not attempt to start the engine with the handcrank. There is not enough clearance to turn the handcrank a full revolution and the operators hand will be injured.

1. *Hand Crank.* The handcrank (fig. 2-1) is normally stored on the side of the engine housing. It is to be used for maintenance purposes only, such as timing the engine or adjusting the valves where a full revolution of the handcrank is not required.

Paragraph 2-9 d. A warning note is added after paragraph 2-9 d as follows:

### WARNING

Turn spraybar take-up crank slowly when raising or lowering spraybar. Limited clearance between crank and hand rail may cause injury to hands.

Page 2-3. Figure 2-1 is superseded as follows:

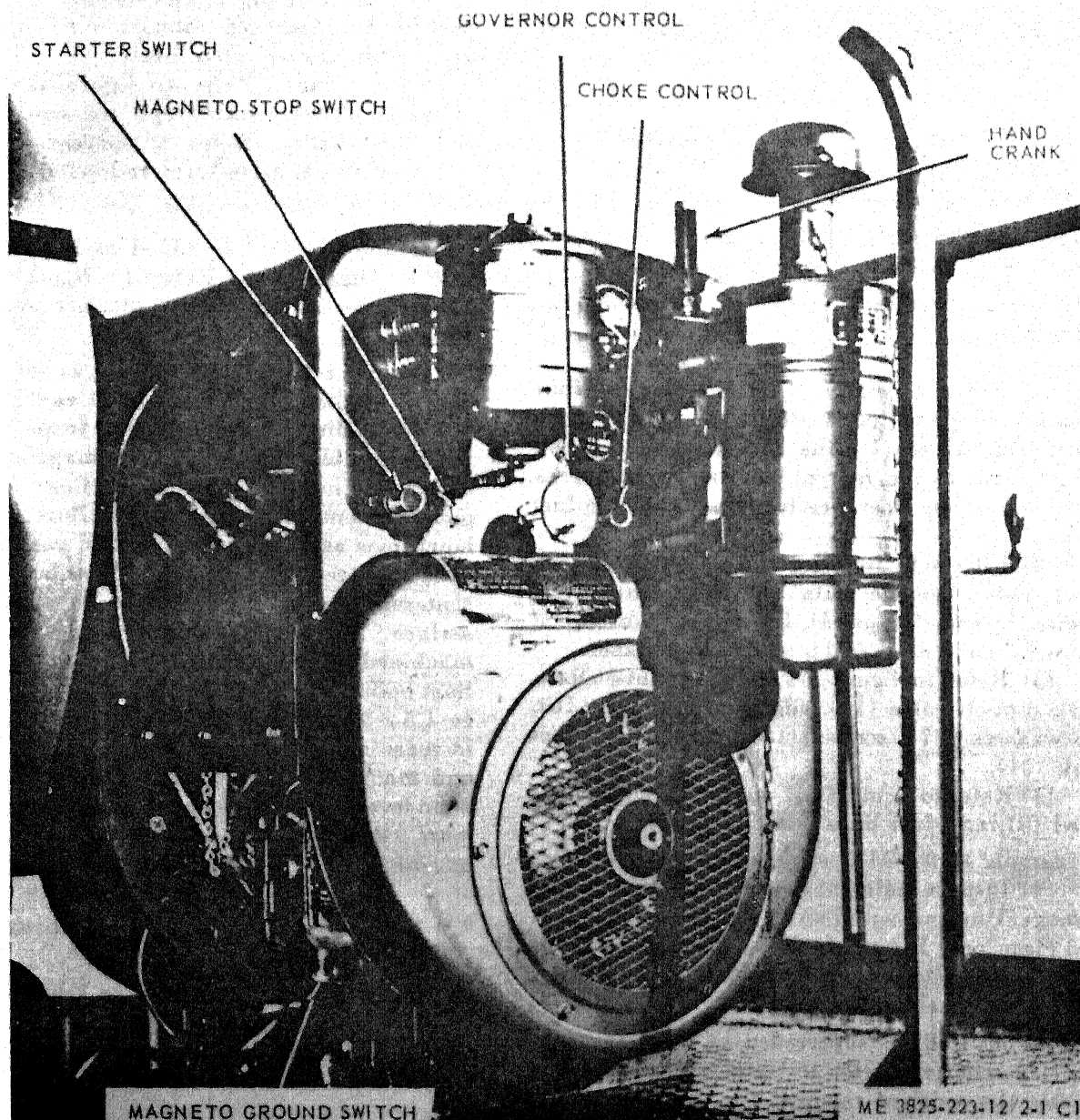


Figure 2-1. Engine controls and instruments.

Page 2-6, figure 2-3. In step 5, add the words "COUNTERCLOCKWISE" between the words "ADJUST GOVERNOR CONTROL" and "TO DESIRED ENGINE SPEED".

Page 2-7, figure 2-4. In step 1, add the word "CLOCKWISE" between the words "TURN GOVERNOR CONTROL" and "TO IDLE POSITION AND ALLOW THE ENGINE TO IDLE THREE MINUTES".

Page 3-1. Paragraph 3-4 e.1 is added as follows:

e.1. *Lubrication Interval.* The water pumping engine mechanical hourmeter is to be used for servicing interval.

Page 4-2, table 4-1, item number 7. In the "Item to be inspected" column, the words reading "Fuel lines and tank" are changed to read "Fuel lines, tank and sediment bowl". In the "Procedure" column, add the following: "Inspect for dirty or damaged sediment bowl. Replace damaged parts or dirty filter element."

Page 4-4. Paragraph 4-18 a (1) is rescinded.

Page 4-6, figure 4-2. Item 1 is rescinded.

Page 4-7. In the legend for figure 4-2, item No. "1. Muffler" is rescinded.

Page 4-9, paragraph 4-23 a. In line 2, "pull-pull switch" is changed to read "push-pull switch".

Page 4-12. Paragraph 4-28 b is superseded as follows:

b. *Removal.*

(1) Refer to figure 4-5 and remove four hexagon nuts and lockwashers from the two U-bolts. Remove the U-bolts and force the control valve piping to the rear of the vehicle as far as possible to allow clearance for removal of the fuel tank.

(2) Refer to figure 4-5.1 and close fuel shut-off valve (14); remove nuts (1) lockwashers (2), screws (3) and clamps (4). Disconnect tube (5) at elbow (13) and drain fuel tank into a container.

(3) Refer to figure 4-5.1 and remove elbow (13), shut-off valve (14), adapter (15), nuts (16), lockwashers (17), screws (18), and remove fuel tank (21).

(4) Refer to figure 4-5.1 and remove sediment bowl (9), and fuel lines and fittings.

Paragraph 4-28 c (4) is superseded as follows:

(4) Inspect sediment bowl for cracks or other damage. Unscrew wire bail and remove glass bowl and clean out. Inspect fuel filter element for dirt and replace element and gasket if necessary. Reassemble fuel sediment bowl.

Paragraph 4-28 d is superseded as follows:

d. *Installation.* Refer to paragraph 4-28 b and reverse the order of removal.

Page 4-13. Paragraph 4-29.1 is added as follows:

4-29.1. *Muffler and Pipes*

a. *Description.* The muffler is designed to reduce the exhaust noise to an acceptable level. Exhaust gases are piped from the manifold through the rear engine housing and down below the chassis frame where the muffler is located.

b. *Removal.*

(1) Remove the canopy (para 4-18).

(2) Refer to figure 4-6.1 and remove the muffler and disconnect the pipe clamp.

(3) Refer to figure 4-6.2 and unscrew the pipes and elbows.

c. *Disassembly.* Refer to figure 4-6.3 and disassemble muffler in sequence indicated.

d. *Cleaning, Inspection and Repair.*

(1) Clean thread ends of pipe with wire brush.

(2) Inspect pipes, elbows and muffler components for damaged threads, cracks or warped areas. Replace defective parts.

e. *Reassembly.* Refer to figure 4-6.3, reverse sequence of disassembly and reassemble muffler.

f. *Installation.* Refer to paragraph 4-29.1 b, reverse removal procedures and install muffler and pipes.

Paragraph 4-30 b.1 is added as follows:

b.1. *Disassembly.* Refer to figure 4-7.1 and disassemble carburetor in number sequence indicated.

Paragraph 4-30 c (1.1) is added as follows:

(1.1) Clean carburetor bowl and be sure it is free of any dirt or metal particles. Inspect cover and bowl assemblies for cracks or damage to machined surfaces. Inspect position of float for correct measurement to obtain proper float level. With bowl cover assembly in an inverted position, viewed from the free end of float, the float bodies must be centered and at right angles to the machined surface. The float setting is measured from the machined surface (no gasket) of cover to top side of float bodies at highest point. The dimension should be  $1\frac{5}{32}$  inches plus or minus  $\frac{3}{64}$  inches. To increase or decrease distance between float body and machined surface, use long nosed pliers and bend lever close to float body. If float position is off more than  $\frac{1}{16}$  inches replace carburetor assembly.

NOTE

Do not bend, twist or apply pressure to float bodies.

Paragraph 4-30 c1 is added as follows:

c.1. *Reassembly.* Refer to figure 4-7.1, reverse number sequence and reassemble carburetor.

Paragraph 4-30. After paragraph 4-30 c, the paragraph heading that reads "*b. Installation*" is changed to read "*d. Installation*". The paragraph

heading that reads "*c. Adjustment*" is changed to read "*e. Adjustment*"

Page 4-14. Figure 4-5 is superseded as follows:

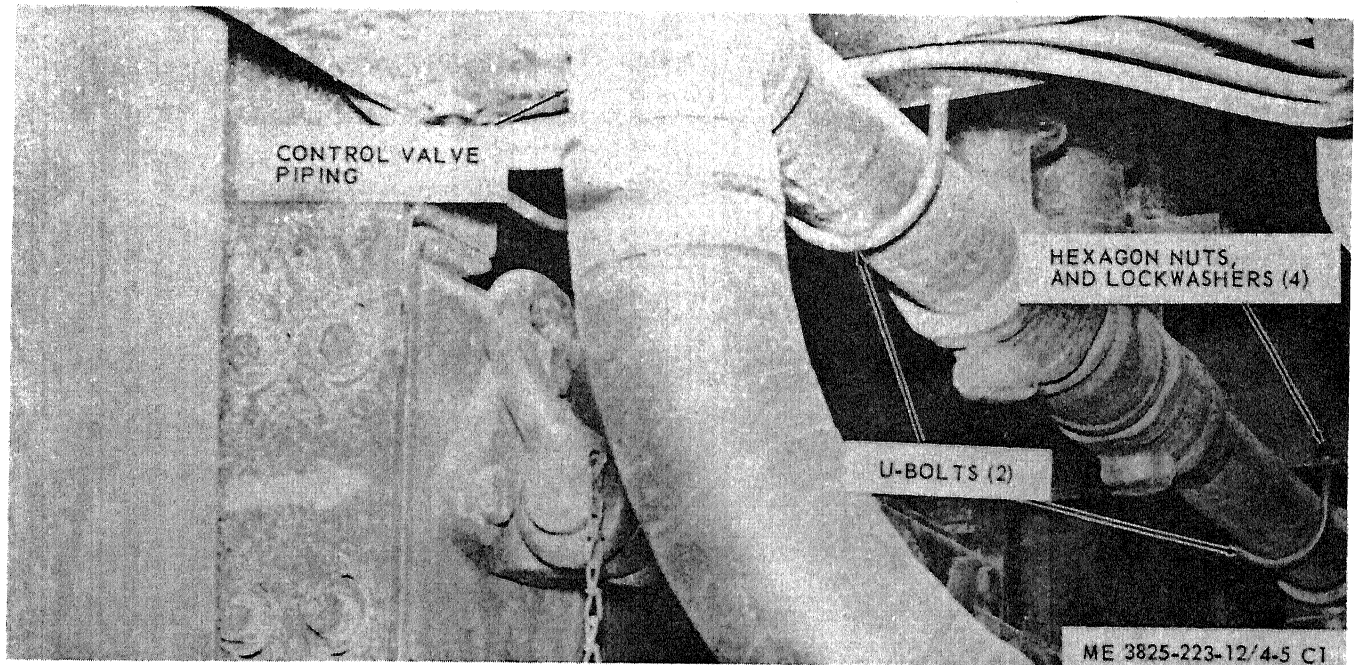
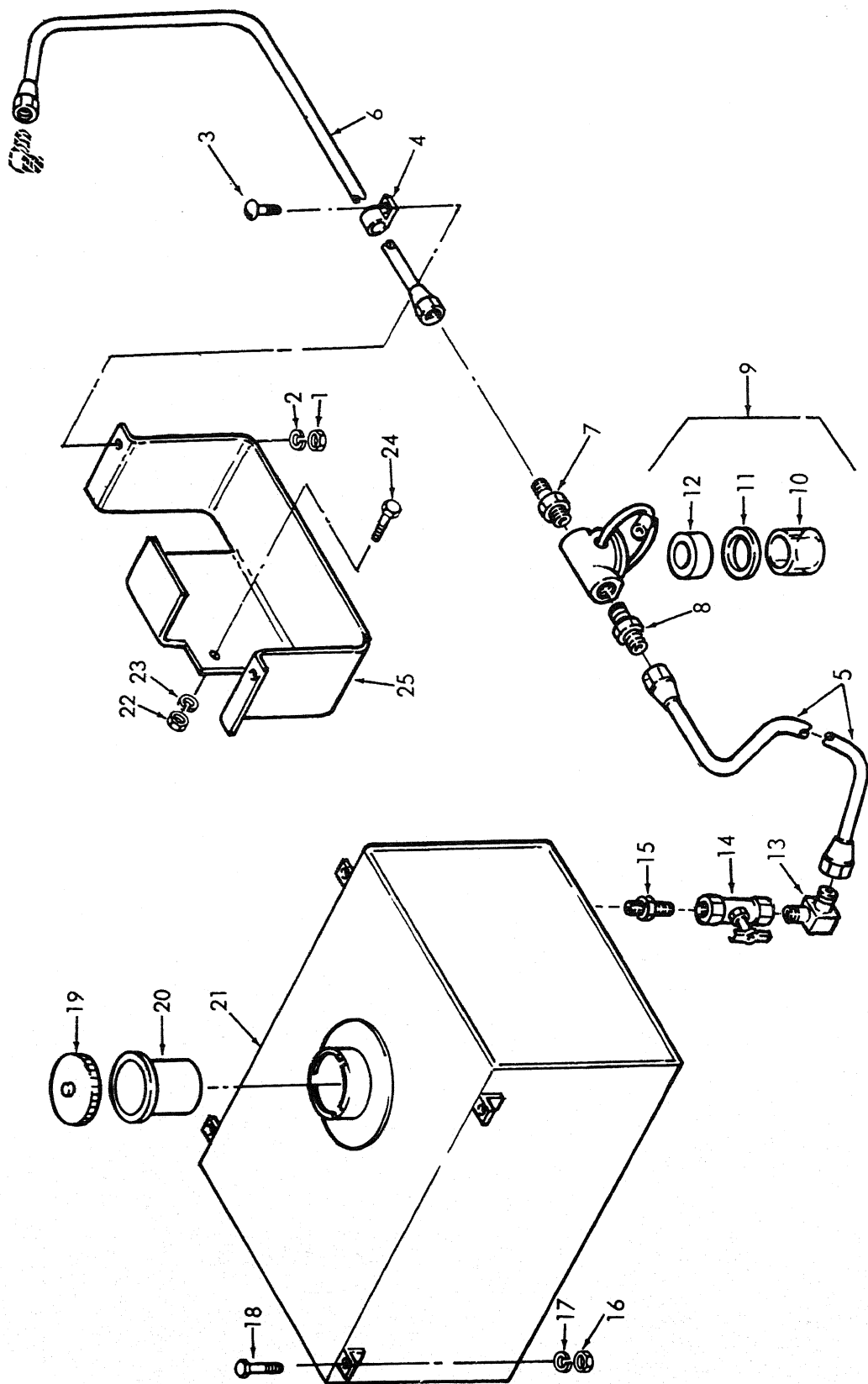


Figure 4-5. Fuel tank removal.

Figure 4-5.1 is added as follows:



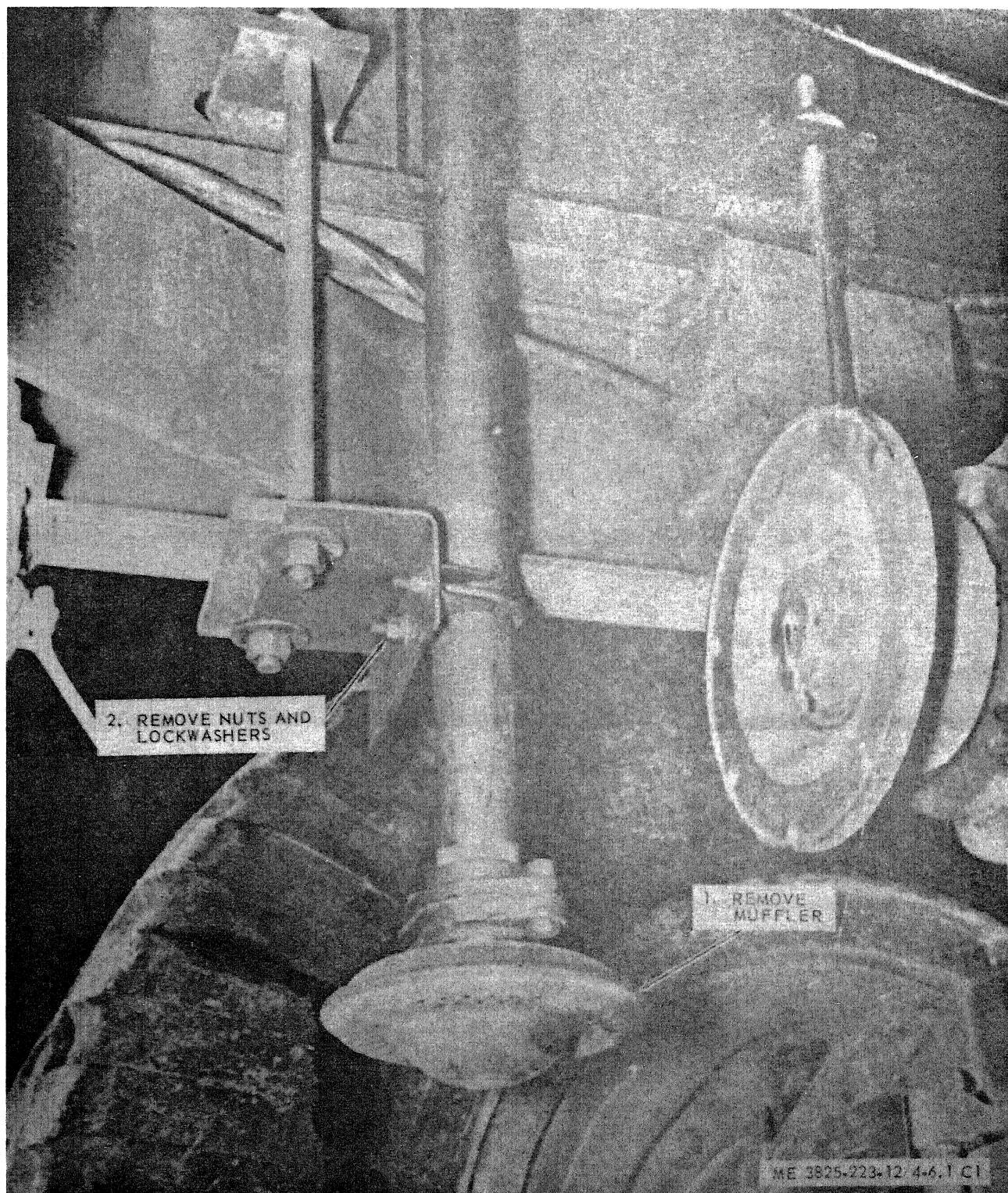
- LEGEND
- |           |                  |                   |              |
|-----------|------------------|-------------------|--------------|
| 1. NUT    | 7. ADAPTER       | 13. ELBOW         | 19. CAP      |
| 2. WASHER | 8. ADAPTER       | 14. SHUTOFF VALVE | 20. STRAINER |
| 3. SCREW  | 9. SEDIMENT BOWL | 15. ADAPTER       | 21. TANK     |
| 4. CLAMP  | 10. GLASS BOWL   | 16. NUT           | 22. NUT      |
| 5. TUBE   | 11. GASKET       | 17. WASHER        | 23. WASHER   |
| 6. TUBE   | 12. ELEMENT      | 18. SCREW         | 24. SCREW    |
|           |                  |                   | 25. BRACKET  |

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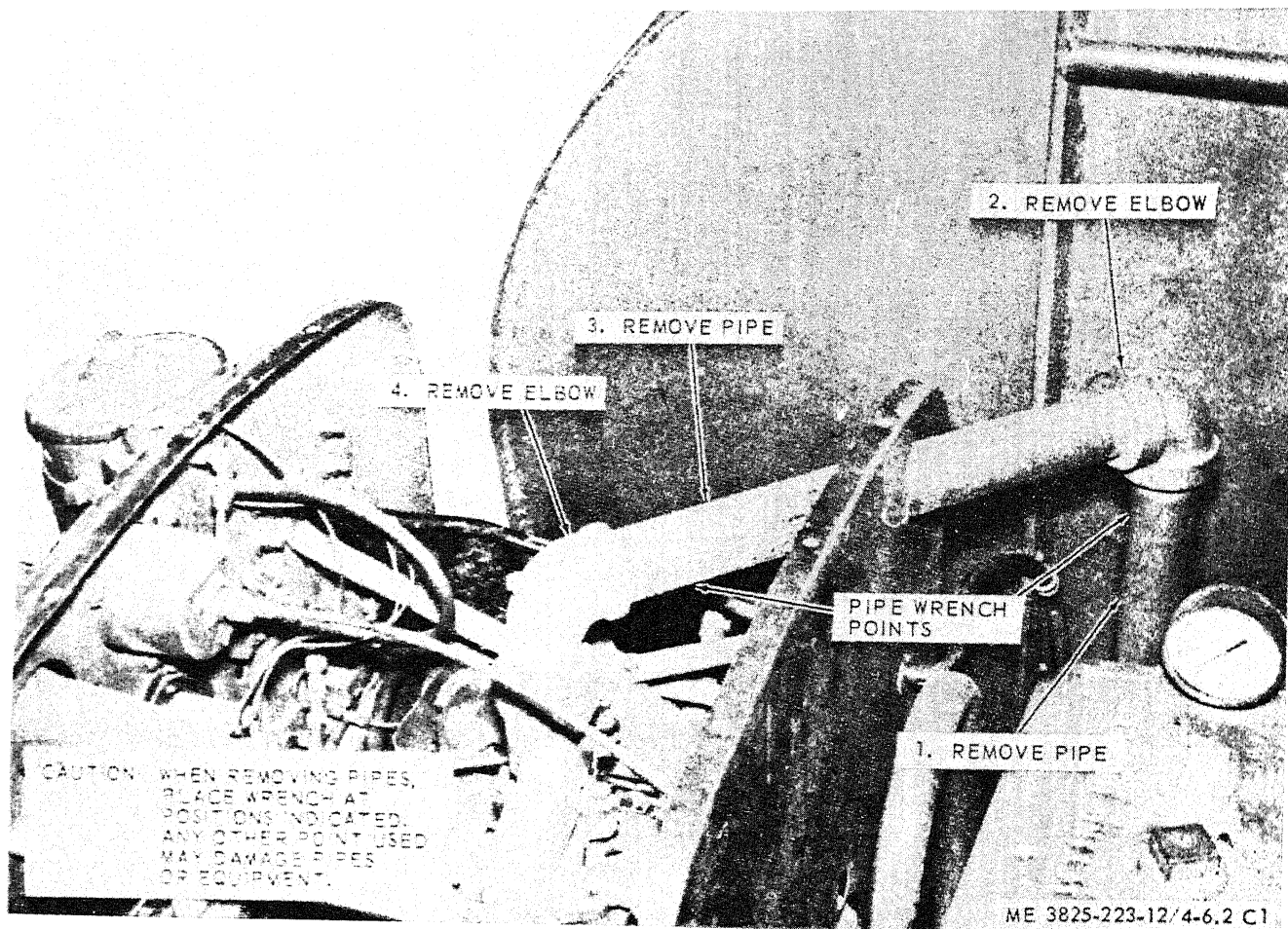
Figure 4-5.1. Fuel tank, lines and fittings.



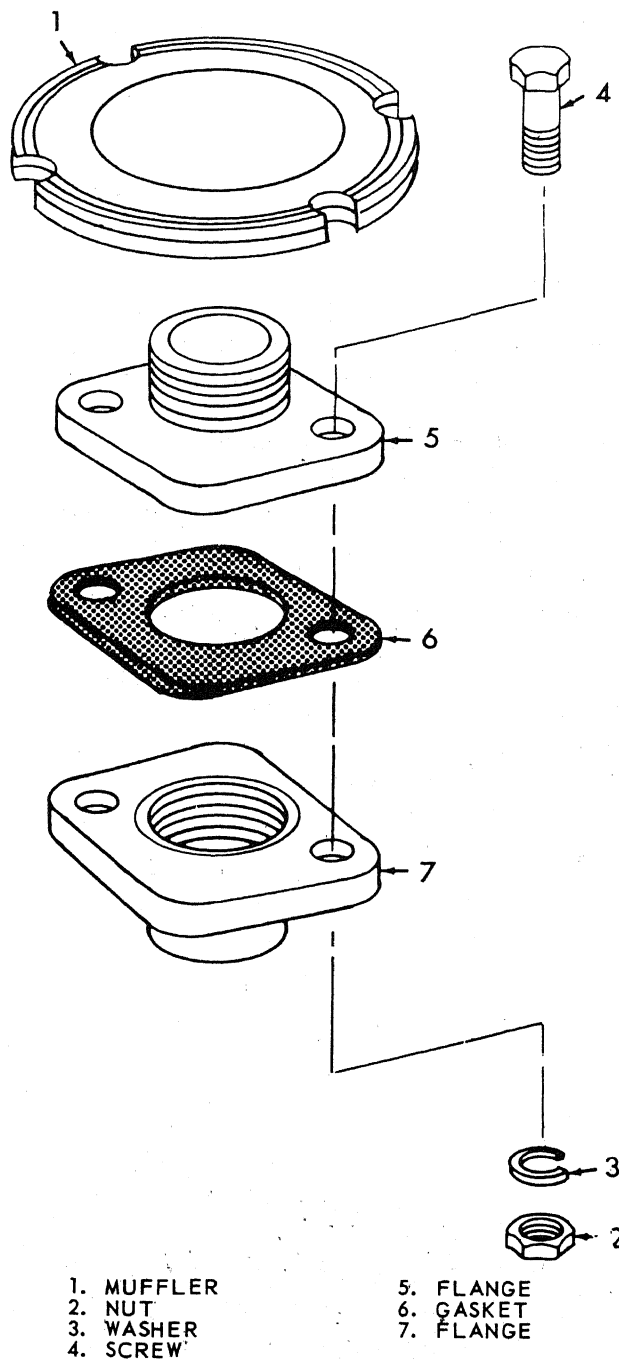
Page 4-15. Figures 4-6.1, 4-6.2, and 4-6.3 are added as follows:



*Figure 4-6.1. Muffler removal and installation.*



*Figure 4-6.2. Exhausts pipes removal and installation.*

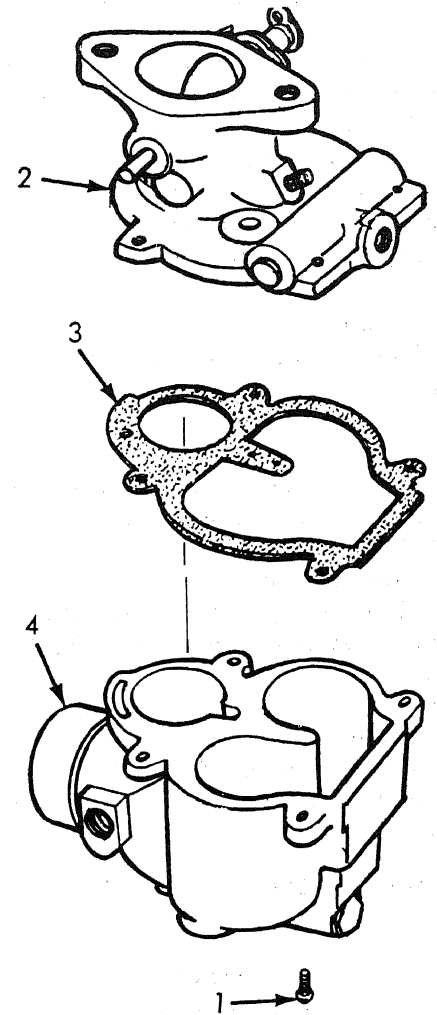


- 1. MUFFLER
- 2. NUT
- 3. WASHER
- 4. SCREW

- 5. FLANGE
- 6. GASKET
- 7. FLANGE

ME 3825-223-12/4-6.3 C1

Figure 4-6.3. Muffler disassembly and reassembly.



ME 3825-223-12/4-7.1 C1

- 1. SCREW
- 2. COVER ASSEMBLY
- 3. GASKET
- 4. BODY ASSEMBLY

Figure 4-7.1. Carburetor disassembly and reassembly.

Page 4-17. Paragraph 4-33 c is superseded as follows:

#### CAUTION

When replacing the starter end plate, be sure to note on the face of the end plate the letters "R" and "L" are stamped. The letter "R" is to be aligned with the terminal stud. If the letter "L" is aligned with the terminal stud, it will result in left hand rotation which may damage the starter.

c. *Replacement of Brushes.* Refer to figure 4-10.

- (1) Remove starter.
- (2) Loosen screw and remove cover band (1).
- (3) Remove four screws and lockwashers and slide commutator end plate (6) away from housing.



(4) Unsolder or uncrimp brush leads as necessary and remove brushes (2 and 3) from brush holder.

(5) Install new brushes in brush holder and resolder or recrimp brush leads as necessary.

(6) Slide commutator end plate carefully up to housing, making sure the brushes are seated properly on the armature, then replace and tighten four screws and lockwashers.

*Page 4-18.* Paragraph 4-34 *b* is superseded as follows:

*b. Removal.*

(1) Refer to figure 4-2 and remove the doors and canopy.

(2) Refer to figure 4-3 and remove air shrouds (11) and (19).

(3) Refer to figure 4-12 and remove the spark plug cables (1) from the magneto.

(4) Refer to figure 4-12 and remove the magneto stop switch wire (2).

(5) Refer to figure 4-12 and remove the high temperature safety switch by removing the terminal screw (3).

(6) Refer to figure 4-12 and remove the holddown bolt (4).

(7) Refer to figure 4-12 and remove the adjusting bolt and remove the magneto from its mounting.

*Page 4-19,* paragraph 4-34 *d* (10). Add note as follows:

**NOTE**

If the engine is mounted on the water distributor, the magneto must be removed prior to adjustment.

*Page 4-24.* Paragraph 4-41 *a* is superseded as follows:

*a. Removal.*

(1) Remove the engine side doors.

(2) Disconnect the battery cable from the starter switch and pull it through the rear engine panel.

(3) Refer to figure 4-5.1 and close the fuel shut-off valve (8). Disconnect and remove fuel tube (6).

(4) Remove four nuts and lockwashers and remove the engine mounting bolts.

(5) Drain water tank (para 2-14).

(6) Refer to figure 4-18, remove clamps (8) and pull rubber hose from nipples.

(7) Refer to figure 4-18, remove clamps (1) from rubber hose.

(8) Attach suitable lifting device to engine/pump unit lifting eye and lift unit until nipple attached to elbow (2) clears rubber hose and remove hose.

(9) Remove elbow (2), nipple (3), valve (4) and nipple (5) from tee (6).

Paragraph 4-41 *c* (2) is superseded as follows:

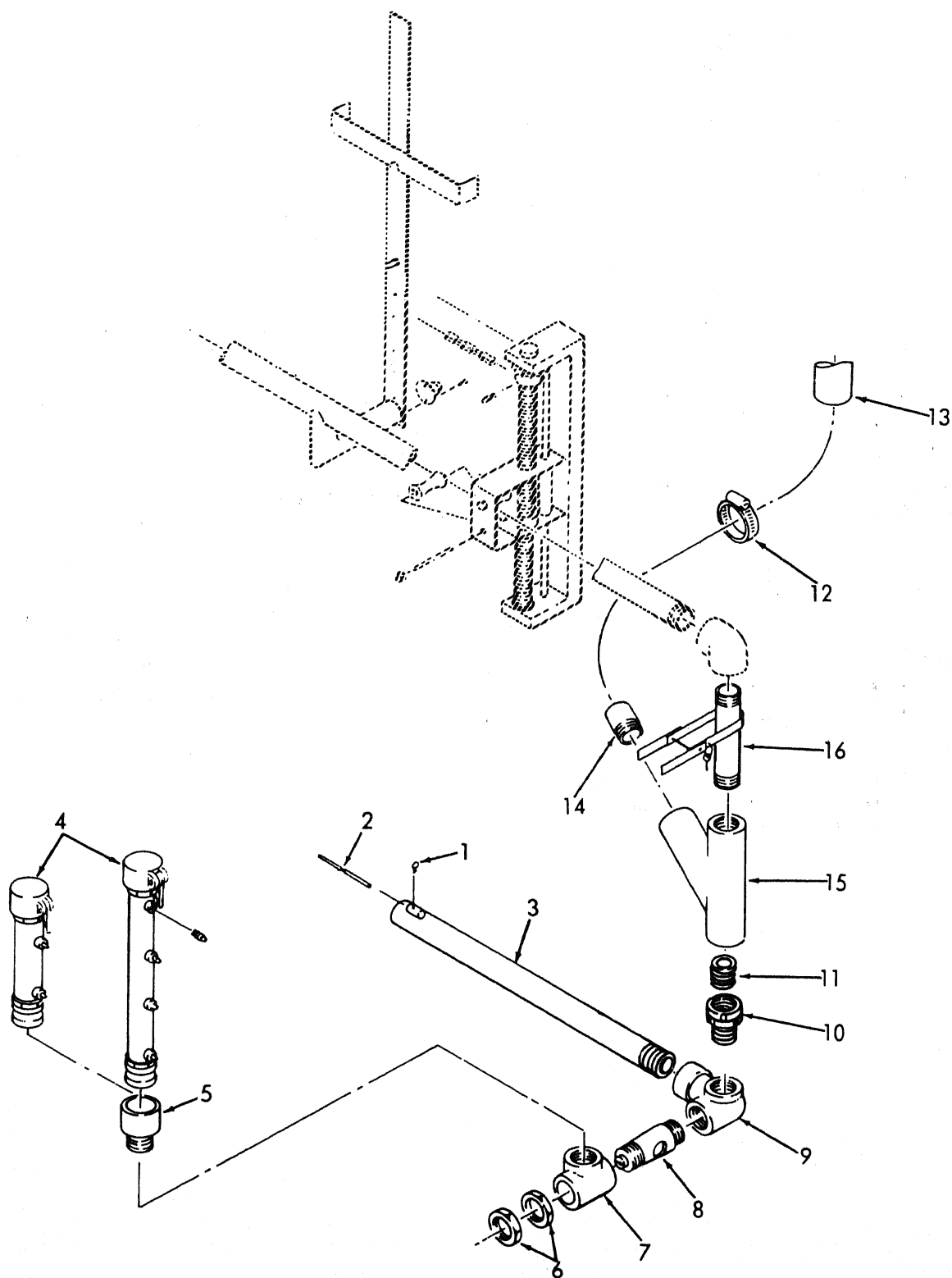
(2) Refer to paragraph 4-41 *a* and reverse removal procedures.

*Page 4-25.* Paragraph 4-44 *a* (4) is superseded as follows:

(4) Unscrew and remove side outlet elbow (9), hose swivel (10) and nipples (11).

*Page 4-26,* figure 4-18. Item "2" depicting a valve next to item "13" is changed to read "12".

*Page 4-28.* Figure 4-19 is superseded as follows:



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Figure 4-19. Spraybar and piping.

Page 4-29. In the callouts for figure 4-19, Item No. "1. Setscrew" is changed to read "Screw". Item No. "10. Nipple" is changed to read "Swivel". Item No. "11. Swivel" is changed to read "Nipple".

Page 4-31. Paragraph 4-53 b (1) is superseded as follows:

(1) Loosen nuts and disconnect bitumeter drive cable (1) and pull through the floor of the carrier.

Paragraph 4-53 b (2). In line 1, "three bolts" is changed to read "two bolts".

Paragraph 4-53 b (3) is rescinded.

Paragraph 4-53 c (1) is superseded as follows:

(1) Remove cotter pin (5) and nut (6) securing frame (13) to mounting bracket (4). Remove bitumeter frame and wheel assembly from mounting bracket (4).

Paragraph 4-53 c (2) is superseded as follows:

(2) Remove setscrew (7) and remove drive unit (8).

Paragraph 4-53 c (3) is superseded as follows:

(3) Remove setscrew (9) securing wheel assembly (11).

Paragraph 4-53 c (4). In line 1, "four nuts" is changed to read "two nuts".

Paragraph 4-53 c (5). In line 1, "(14)" is changed to read "(12)".

Paragraph 4-53 c (6). In line 1, "three bolts" is changed to read "two bolts". In line 3, "(15)" is changed to read "(14)".

Paragraph 4-53 d (5) is superseded as follows:

(5) Inspect all hardware for damage. Repair or replace as necessary.

Paragraph 4-53 e (6) is superseded as follows:

(6) Position bitumeter frame in mounting bracket, secure with washers, nut and cotter pin.

Paragraph 4-53 f (4). In line two, "three bolts" is changed to read "two bolts".

Page 4-32, paragraph 4-53 f (7). In line 1, "three bolts" is changed to read "two bolts".

Paragraph 4-55 a is superseded as follows:

*a. Removal.*

(1) Disconnect signal gong pull cables from signal gong by cutting off crimp type cable clamps.

(2) Remove four screws, nuts and lockwashers securing signal gong to bracket and remove signal gong.

Paragraph 4-55 b is rescinded.

Paragraph 4-55 c (4) is rescinded.

Paragraph 4-55 d is rescinded.

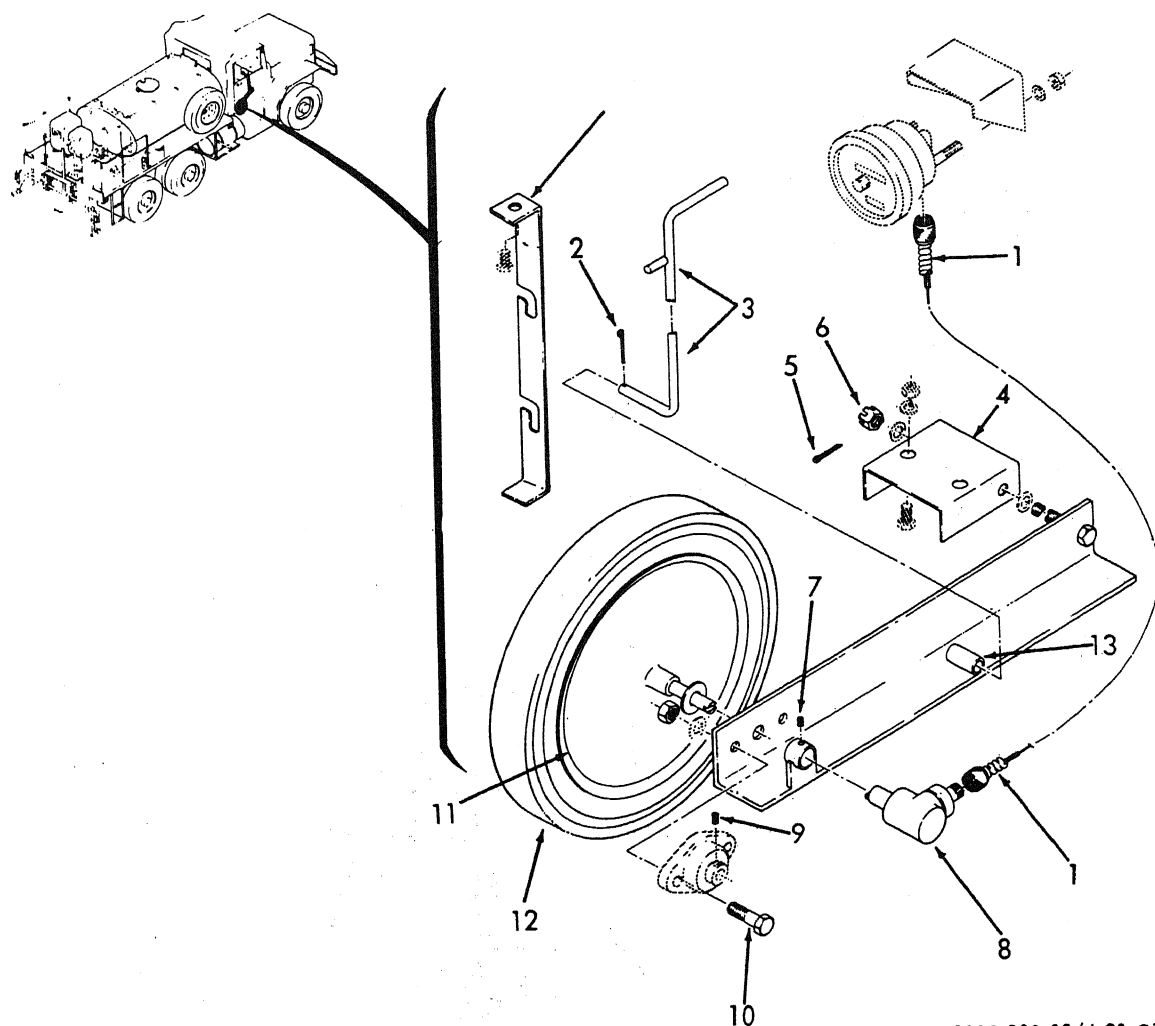
Paragraph 4-55 e is superseded as follows:

*e. Installation.*

(1) Position signal gong on brackets and secure with four screws, nuts and lockwashers.

(2) Connect pull cables by looping cables through signal gong arms and applying new crimp type cable clamps.

Page 4-33. Figure 4-20 is superseded as follows:



ME 3825-223-12/4-20 C1

#### LEGEND

1. CABLE
2. COTTER PIN
3. LIFT ROD
4. BRACKET
5. COTTER PIN
6. NUT
7. SETSCREW

8. DRIVE UNIT
9. SETSCREW
10. BOLT
11. WHEEL ASSEMBLY
12. TIRE
13. FRAME
14. BRACKET

Figure 4-20. Bitumeter assembly.

Page 4-35. Paragraph 4-57 c(1) is superseded as follows:

(1) Remove pipe rolls from pipe roll frame by removing self-locking nuts, flatwashers and bolts.

Paragraph 4-57 e(1) is superseded as follows:

(1) Install pipe rolls in pipe roll frame, slide bolts through pipe roll frame and pipe roll and add self-locking nuts and flatwashers.

Paragraph 4-57 e(2) is superseded as follows:

(2) Tighten self-locking nuts on pipe roll bolts. Be sure pipe roll still turns freely after tightening nuts.

Paragraph 4-57 e(3). In line 2, "belts" is changed to read "bolts".

Paragraph 4-58.1 is added as follows:

#### 4-58.1. Bed Access Step

a. Removal. Refer to figure 4-22.1.

b. Cleaning, Inspection and Repair.

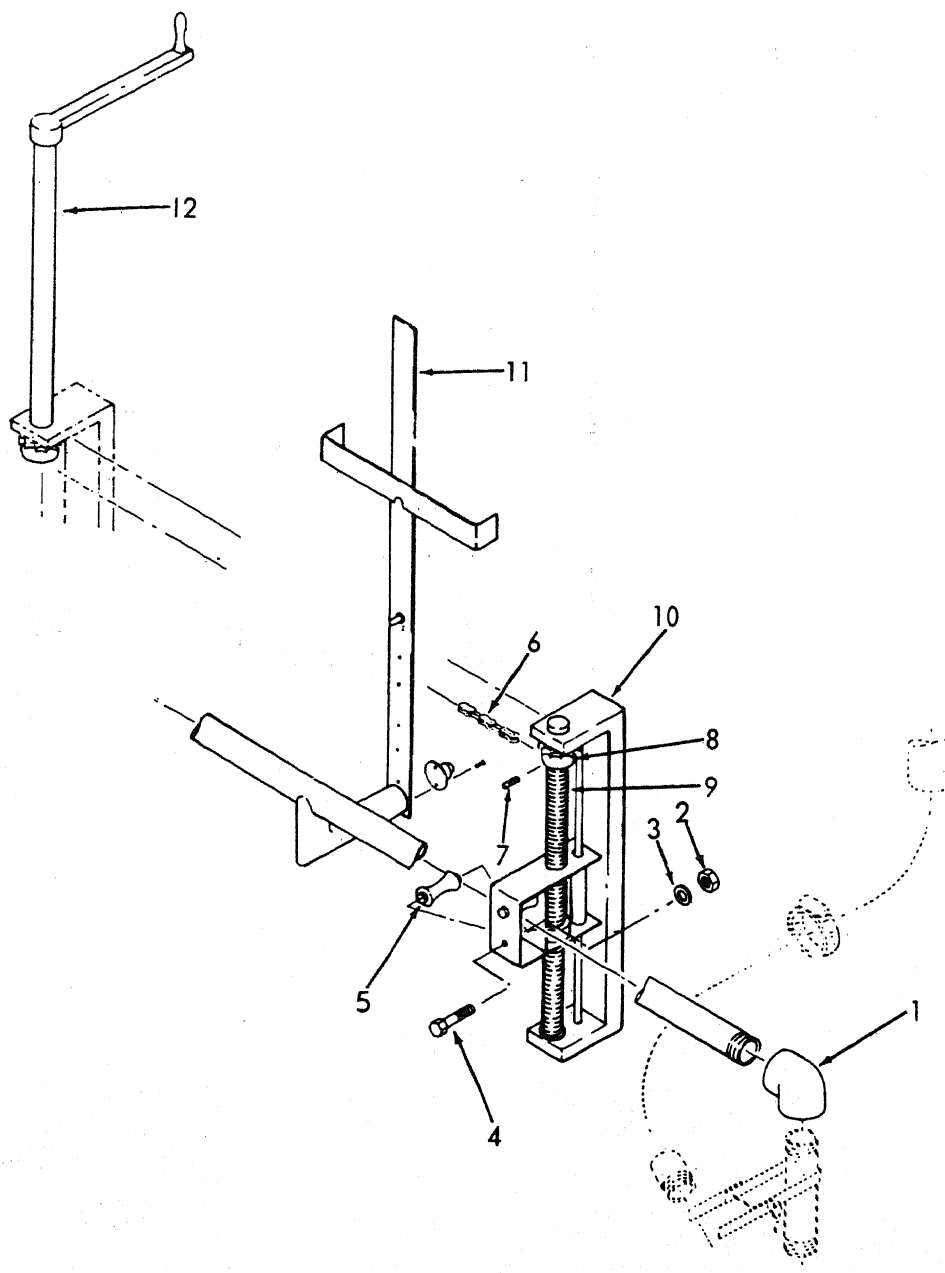
(1) Clean all parts in solvent, Federal Specification P-D-680.

(2) Brush off all rust and corrosion.

(3) Inspect step for dents, bends, corrosion damage or broken welds. Repair or replace step.

c. Installation. Refer to figure 4-22.1.

Page 4-36. Figure 4-22 is superseded as follows:



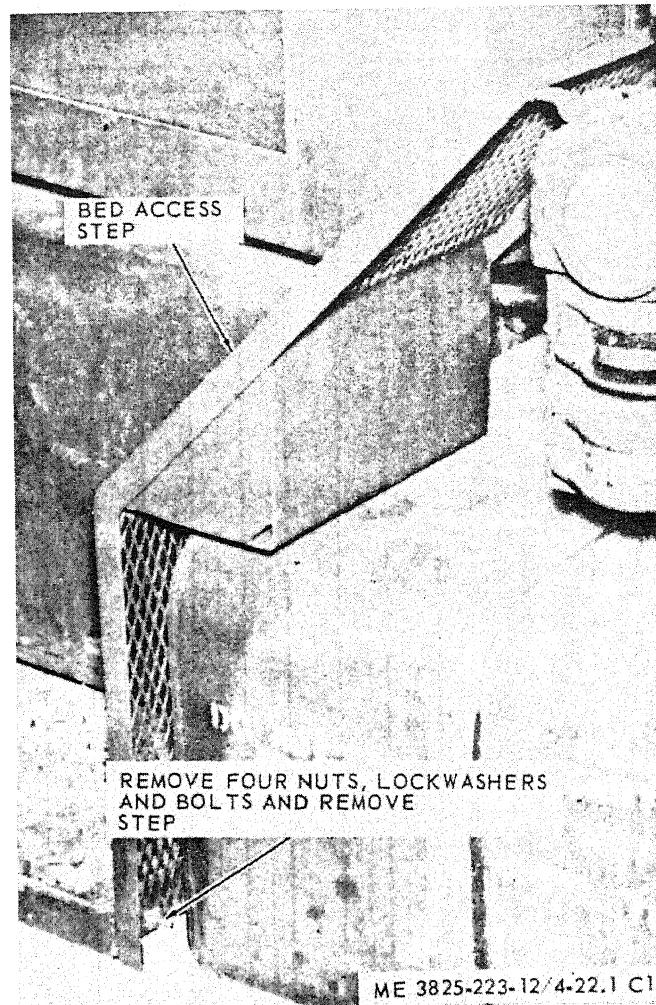
ME 3825-223-12/4-22 C1

Figure 4-22. Spraybar take up assembly.

Page 4-37, callouts for figure 4-22. Item "3. Shaft" is changed to read "Washer". Item "4. and "Bolts". Item "5. Pipe"

is changed to read "Roller".

Figure 4-22.1 is added as follows:



*Figure 4-22.1. Bed access step.*

**Page B-2. Section II is superseded as follows:**

## Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
01	Fuel Tank, Lines and Sediment Bowl:													
	Tank, fuel	O		C					O					
	Lines and fittings	O							O					
	Sediment bowl	O		O					O	O				
02	Water Hoses, Valves, Spraybar, Controls and Pipes:													
	Suction and discharge hoses	O							O	O				
	Valve, foot	O							O					
	Strainers			C					O					
	Pipes, fittings, hoses, control valves, and nozzles	O							O					
	Controls, spraybars, extensions, and extension pivot valve	O							O					
	Pressure gage		O						O	O				
03	Engine and Pump Assembly:								O					
	Electrical lead (to battery)	O							O	O				
	Engine oil drain piping	O							O					
	Engine and pump assembly	O							F					
04	Water Pump:			O					F	F				
	Impeller	F							F					
	Valve, check	F							F					
	Fill and drain plugs	O							F					
05	Engine Assembly:	C	O	C					O					
	Doors, Hood and Housing Shrouds, Deflectors and Screens	O							O		H			A-B
	Rear housing panel	O							O					
	Air cleaner	C		O					O					
	Air cleaner hose	C							O					
	Filter, oil			C					O					
	Muffler and pipes	O							O					
	Instrument panel:	O							O					
	Gage, pressure	O							O					
	Tachometer, mechanical		F						O					
	Tachometer, drive			O					O					
	Meter, time totalizing, electrical	O	F						O					
	Switches	O	O						O					
	Wiring	O	O						O					
	Hand crank	C							O	O				
	Starter:		O						O					
	Brushes	O							O	F				
	Magneto:			O	O				O	F				
	Points				O				O					
	Spark plug leads	O							O					
	Spark plugs	O	O		O				O					
	Carburetor	O		O					O					
	Fuel pump	O							O					
	Fuel primer	O							O					
	Muffler	O							O					
	Exhaust pipes	O							O					
	Manifolds	O							O					
	Oil lines and fittings	O							O					
	Governor								O					
	Governor controls	O							O	F				B-H
	Flywheel	O							O					
	Flywheel ring gear	O							O					
	Cylinder head	O							O					
	Crankcase, block	O							O					
	Crankshaft, bearings, seals	H							H	H				
	Pistons, rings, and connecting rods	H							H					

## Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
05	Engine Assembly—Continued													
	Valve lifters	O			O				H					C-H
	Cover, valve lifter	O							O					
	Valves	F							F	F				
	Seats	F							F	F				
	Guides, springs, locks, button, gears, covers	F							F					
	Camshaft and bearings	H							H					
	Pump, oil	F							F					
	Plate, crankcase bottom	F							F					
	Cap, breather			C					O					
	Filler, tube	O		O					O					
	Dipstick	C							O					
06	Lights and Switches:													
	Tail lights								O	O				
	Clearance marker lights								O	O				
	Turn signal lights								O	O				
	Lamps		C						O					
	Lens	C							O					
	Gaskets	C							O					
	Hazard warning switch	O		O					O	O				
	Flasher			O					O					
07	Signal Gong	O							O					C-H
08	Tank Assembly and Capacity Gage:													
	Tank capacity gage	O							O					
	Plates, data and instruction	O							O					
	Tank assembly	O							H	F				
	Spare tire retainer	C							O					
	Pipe, wire lead	O							O					
	Manhole cover	C							O					
09	Frame and Platform Assembly:	O							H	F				
	Ladder	C							O					
	Safety chains	C							O					
	Reflectors	C							O					
10	Bitumeter Assembly:	C												
	Speed and distance gage		O						O					
11	Gasket Sets and Repair Kits								O					
	Ring Set, Piston								H					



Page B-6. Section III is added as follows:

### Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
-------------------	----------------------	--------------	----------------

No special tools or test equipment required.

Page B-6. Section IV is superseded as follows:

**Section IV. REMARKS**

Reference Code	Remarks
A-B	Test includes engine operation and compression check.
B-H	External lines.
C-H	Camshaft removal is necessary.



By Order of the Secretary of the Army:

Official:

VERNE L. BOWERS,  
*Major General, United States Army,  
The Adjutant General.*

W. C. WESTMORELAND,  
*General, United States Army,  
Chief of Staff.*

Distribution:

To be distributed in accordance with DA Form 12-25 (qty rqr block No. 377) operator maintenance requirements for Distributors: Water.



TECHNICAL MANUAL }  
No. 5-3825-223-12 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D. C., 1 July 1970

# OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL:

## DISTRIBUTOR, WATER, TANK TYPE, 1000 GAL CAPACITY, GASOLINE DRIVEN, TRUCK MOUNTED (GENERAL STEEL TANK MODEL 1602) FSN 3825-403-9334

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## CHAPTER 1

### INTRODUCTION.

#### Section I. GENERAL

##### 1-1. Scope

*a.* This manual contains instructions for the use of operating and organizational maintenance personnel that are maintaining the General Steel Tank Company Model 1602 Water Distributor, as allocated by the Maintenance Allocation Chart (MAC). It provides information on the operation, preventive maintenance checks and services and organizational maintenance of the equipment.

*b.* Preparation, care and removal of equipment in administrative storage will be in accordance with the applicable requirements of TM 740-90-1 (Administrative Storage of Equipment).

*c.* Instructions for destruction of material to prevent enemy use will be in accordance with TM 750-244-3 (Procedures for Destruction of

Equipment to Prevent Enemy Use, Mobility Equipment Command.)

##### 1-2. Forms and Records

*a.* Maintenance forms, records, and reports that are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

*b.* Report of errors, omissions and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028, (Recommended Changes to Publications) and forwarded direct to Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

#### Section II. DESCRIPTION AND DATA

##### 1-3. Description

*a. General.* The General Steel Tank Company Model 1602 Water Distributor (fig. 1-1) is a truck mounted unit which consists of a 1000 gallon water tank, pumping unit and associated piping, controls and instruments. The pumping unit is powered by a Wisconsin Motor Corp. Model MVF4D gasoline engine which directly drives a Marlow Model 4D2 centrifugal pump. The primary function of the water distributor is to spray a uniform quantity of water over a designated surface. The distributor may be adapted to auxiliary fire fighting or pumping service.

*b. Water Tank.* The water tank (fig. 1-2) is a 1,070 gallon welded unit. It is constructed of 10 gage steel, oval in cross-section, and equipped with manhole with cover. A water level indicator is mounted on the rear of the tank.

*c. Engine.* The pumping unit power plant (fig. 1-2) is a Wisconsin Model MVF4D, four cylinder,

four stroke cycle, air cooled gasoline engine. It is mounted on the operator's platform at the rear of the distributor. It may be started by an electrical starter or a manual hand crank. Engine speed is controlled by a variable speed governor. It has a magneto ignition system.

*d. Water Pump.* The water pump assembly (fig. 1-2) is a Marlow Model 4D2 manufactured by Fluid Handling, Division of International Telephone and Telegraph. It is a self-priming, centrifugal pump which is coupled directly to the Wisconsin engine. This pump normally operates within the pressure range of 10 to 40 pounds per square inch (PSI) during the spraying operation and is capable of developing 50 PSI.

*e. Spraybar and Piping Assembly.* The spraybar assembly (fig. 1-2) is composed of a framework of discharge lines and nozzles which are supported by an adjustable vertical lift frame. Extensions of the basic spraybar may be added to either or both ends of the spraybar. There are two 2-foot extensions and four 1-foot extensions.



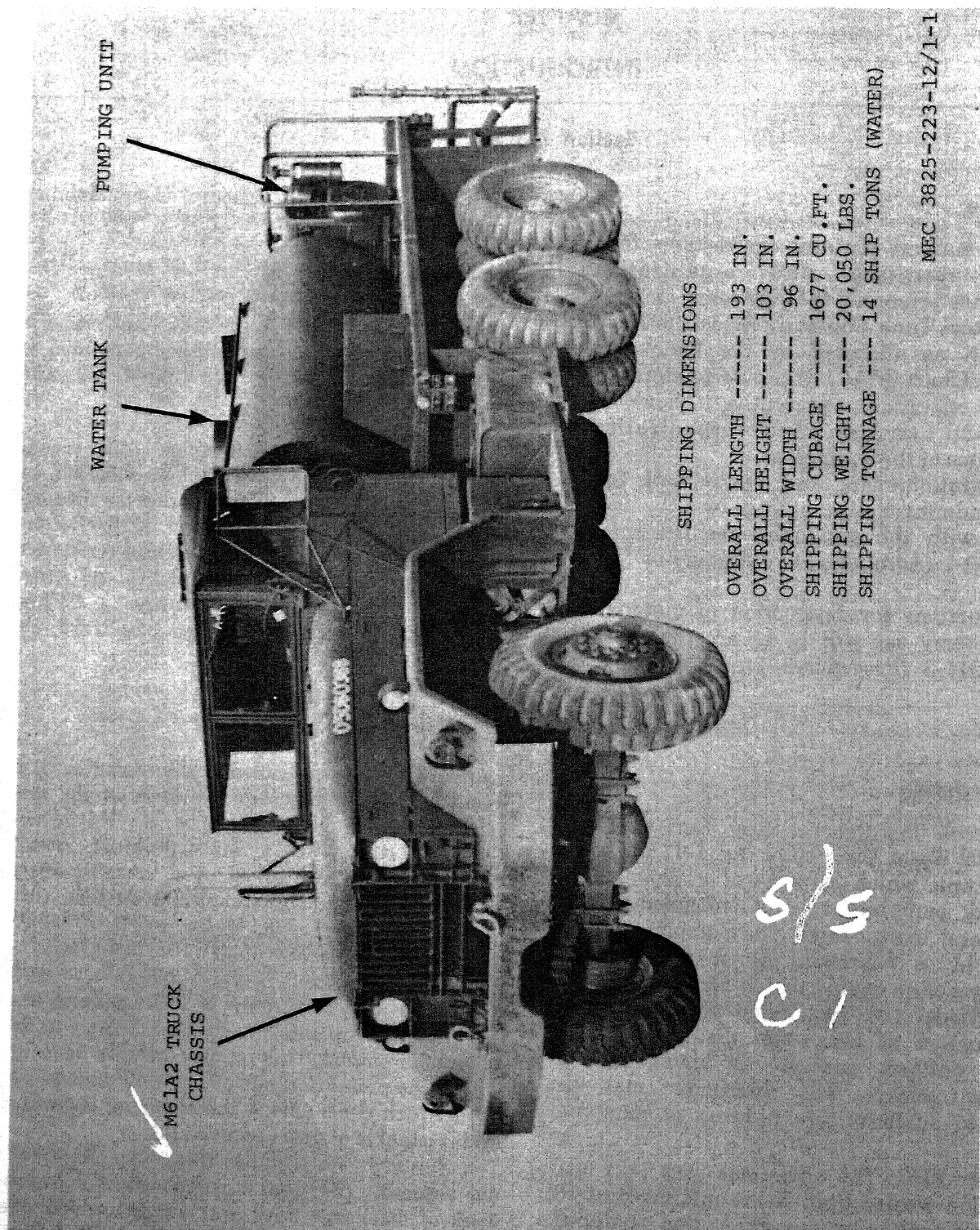
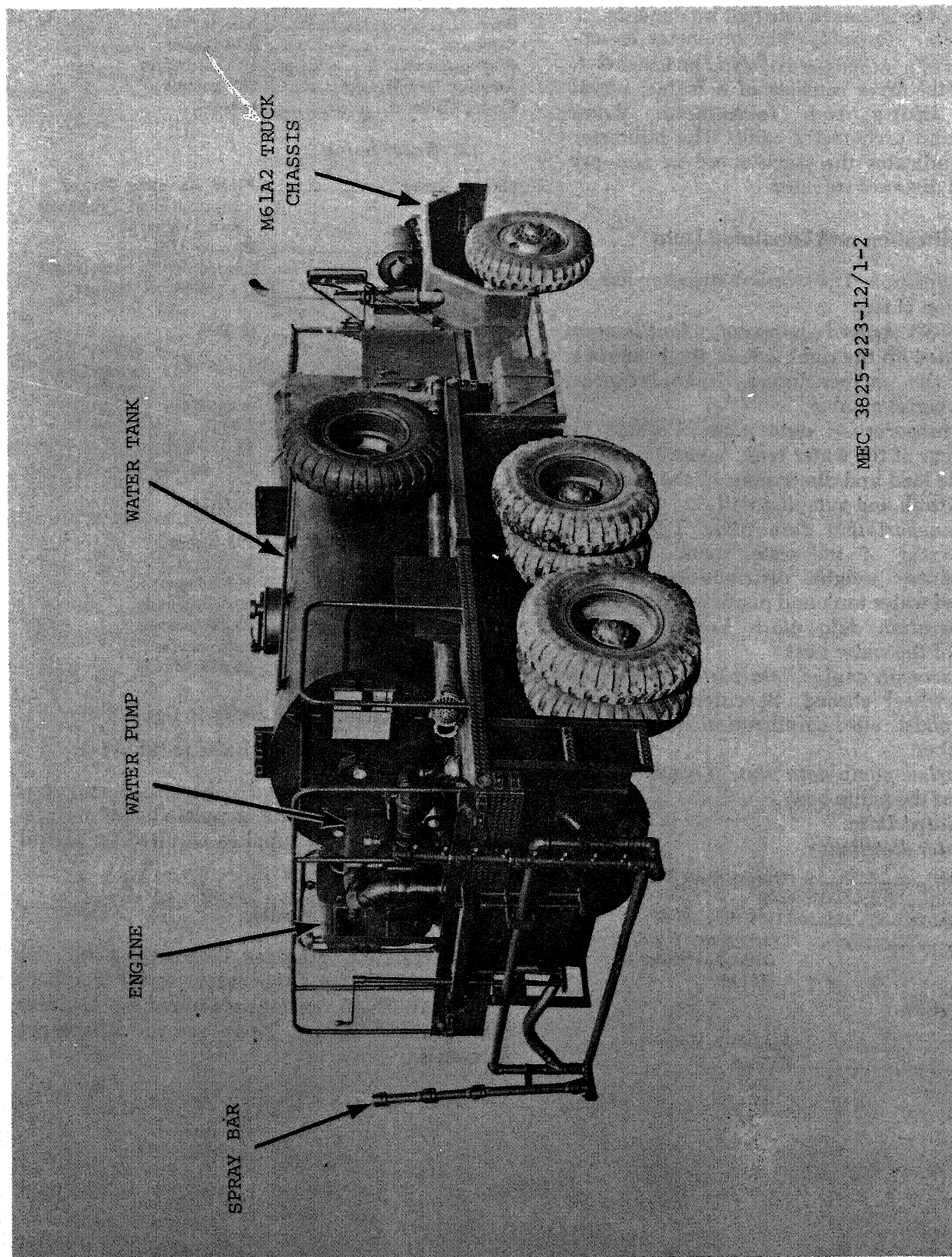


Figure 1-1. Model 1602 Water Distributor, left front view.



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Figure 1-2. Model 1602 Water Distributor, right rear view.

By use of the various combinations of extensions, the spraybar may be adapted to a length from 4 to 16 feet in one foot increments.

*f. Bitumeter Assembly.* The bitumeter assembly consists of a bitumeter drive and a tachometer. The bitumeter drive consists of a frame, wheel assembly, lifting rod, tachometer drive assembly, and tachometer cable. The bitumeter assembly indicates the truck speed in feet per minute and distance traveled.

#### 1-4. Identification and Tabulated Data

*a. Identification.* The water distributor has six identification plates.

(1) *U. S. Army equipment identification plate.* Located on the right side of the hose rack. Specifies the nomenclature, manufacturer, model and serial number.

(2) *Transportation data plate.* Located on the right rear of the water tank. Identifies lifting points, axle load and dimensions of the complete truck with tank and pumping unit.

(3) *Transportation data plate.* Located on the right rear of the water tank. Identifies lifting points, weight distribution and dimensions of water tank and pumping unit only.

(4) *Operation data plate.* Located on the right rear of the water tank.

(5) *Wisconsin engine data plate.* Located on engine flywheel shroud. Specifies the manufacturer, model, size, specification number and serial number.

(6) *Marlow pump data plate.* Located on the right side of the pump body.

##### *b. Tabulated Data.*

##### (1) *Water distributor.*

Manufacturer .....	General Steel Tank Co.
Model No. ....	1602
Serial No. Range .....	77-01 thru 77-85
Chassis .....	Truck, 5-ton, 6 x 6, Ordnance Model No. M61A2

##### (2) *Engine.*

Manufacturer .....	Wisconsin Motor Corp.
Model No. ....	MVF4D

Rated Output .....	25 HP at 2400 RPM
Operating Cycle .....	4 stroke
Cooling System .....	Forced air
Bore .....	3.25 inches
Stroke .....	3.25 inches
Displacement .....	107 cu. inches
Average Dry Weight .....	302 pounds
Firing Order .....	1-3-4-2

##### (3) *Water pump.*

Manufacturer .....	Fluid Handling Div. of International Telephone and Telegraph
Model .....	Marlow 4D2
Type .....	Engine driven centrifugal
Flow Rate .....	238 gallon per minute
Maximum Operating Pressure .....	40 PSI

##### (4) *Capacities.*

Engine Crankcase .....	4 quarts
Air Cleaner .....	1 pint
Fuel Tank .....	14 1/2 gallons
Water Tank .....	1070 gallons

##### (5) *Dimensions and weights.*

Overall Length .....	193 inches
Overall width .....	96 inches
Overall Height .....	103 inches
Net Weight Empty .....	20,050 pounds
Net Weight Filled .....	28,383 pounds
Shipping Volume .....	1677 cu. ft.
Shipping Weight .....	20,050 pounds

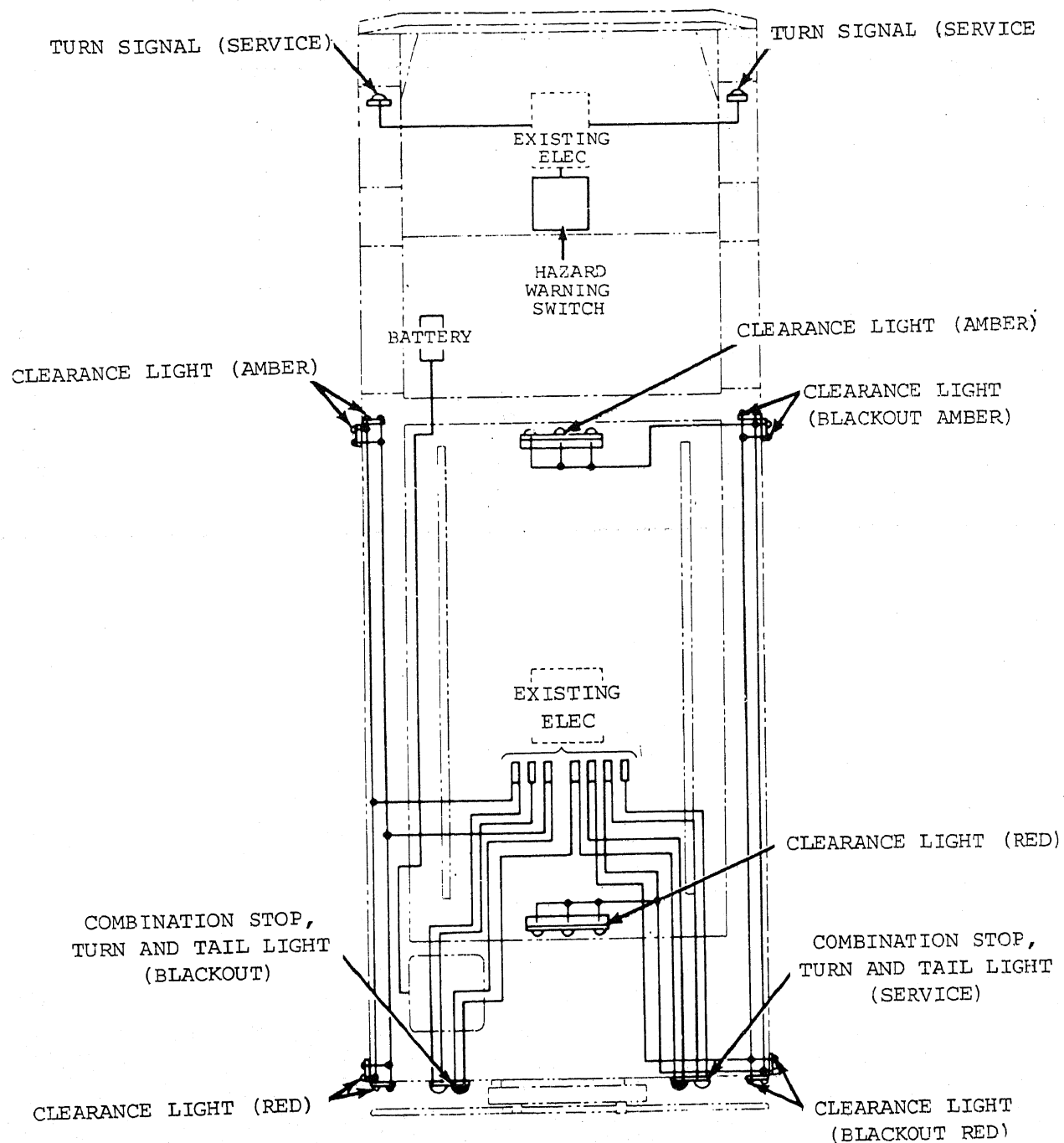
(6) *Wiring Diagram.* Refer to figure 1-3.

(7) *Application chart.* Refer to table 1-1.

(8) *Maintenance and operating supplies.* Refer to Appendix B for a complete list of maintenance and operating supplies required for initial operation.

#### 1-5. Difference in Models

This publication provides instructions for the Model 1602 Water Distributor, serial numbers 77-01 thru 77-85, as manufactured by General Steel Tank Company. There are no differences in models.



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Figure 1-3. Wiring diagram.

Table 1-1. Application Chart

Application rate gal/sq. yd.	Truck speed in feet per minute			
	7 thru 16 foot spraybar		4 thru 6 foot spraybar	
	30 PSI	40 PSI	10 PSI	40 PSI
0.1	1270	-	945	-
0.2	635	-	473	-
0.3	423	-	315	-
0.4	318	-	237	-
0.5	254	-	189	-
0.6	211	-	157	-
0.7	181	-	136	-
0.8	159	-	118	-
0.9	141	-	106	-
1.0	127	-	95	-
1.1	116	-	-	166
1.2	106	-	-	152
1.3	98	-	-	140
1.4	91	-	-	130
1.5	-	114	-	122
1.6	-	108	-	114
1.7	-	102	-	107
1.8	-	97	-	101
1.9	-	93	-	96
2.0	-	89	-	91



## CHAPTER 2

### OPERATING INSTRUCTIONS

#### Section I. SERVICE UPON RECEIPT OF MATERIAL

##### 2-1. Inspecting and Servicing the Equipment

- a. Inspect and service the truck chassis in accordance with TM 9-2320-211-20.
- b. Perform the preventive maintenance services given in table 3-1.
- c. Make a complete visual inspection of entire water distributor to see that the items listed in Appendix C have been shipped with the unit.
- d. Make a complete visual inspection for damaged or missing parts. Report all damaged and missing parts to organizational maintenance.

##### 2-2. Installation of Separately Packed Components

There are no separately packed components. The water distributor is shipped completely assembled and ready for operation.

##### 2-3. Installation or Setting Up Instructions

No special procedures are required for setting up of the water distributor. Remove any packing or tape which was used for shipping.

##### 2-4. Equipment Conversion

###### a. Transfer Pumping.

- (1) Move the water distributor within easy reach of the water source.
- (2) Turn all spray control valves to OFF position.
- (3) Attach suction hose to suction tee and submerge suction hose in water source.

- (4) Attach discharge hose to tee and direct hose to desired location.
- (5) Start engine. (fig. 2-3)

**Caution:** Do not run pump dry. Water is necessary to cool and lubricate the pump.

*Note.* The speed of the engine determines the output of the pump.

- (6) When the pumping is completed, stop the engine.

- (7) Disconnect the hoses and store in the boxes provided on the frame.

###### b. Fire Fighting.

- (1) Using the water stored in the tank:
  - (a) Turn all spray control valves to the OFF position.
  - (b) Attach the discharge hose to the tee and install fire nozzle.
  - (c) Open inlet valve (fig. 2-2).
  - (d) Start engine.

**Caution:** Do not run pump dry.

- (e) Stop engine when fire is extinguished or before tank is empty.
- (f) Close inlet valve. Remove fire nozzle. Disconnect hose and store in box.
- (2) Using external water supply:
  - (a) Turn all spray control valves to the OFF position.
  - (b) Connect hoses and pump water as given in paragraph 2-4a(3) through (7) using the fire nozzle on discharge hose.

#### Section II. MOVEMENT TO A NEW WORK SITE

##### 2-5. Dismantling for Movement

No special procedures are required for movement to a new work site. A check should be made to see that the suction hose and spraybar extensions are secured to the truck. The bitumeter

should be raised for transport.

##### 2-6. Reinstallation After Movement

No special procedures are required. Check for items damaged or lost during movement.

## Section III. CONTROLS AND INSTRUMENTS

## 2-7. General

This section describes the various controls and instruments and provides the operator/crew sufficient information to insure proper operation of the Model 1602 Water Distributor.

## 2-8. Wisconsin Engine Controls and Instruments

*a. Starter Switch.* The starter switch (fig. 2-1) is mounted on the engine housing below the oil filter. This switch activates the starter solenoid.

*b. Magneto Stop Switch.* The magneto stop switch (fig. 2-1) is mounted on the engine housing to the right of the starter switch. It is a two position, push-pull switch. Pushing the switch IN interrupts normal ignition by grounding the magneto. Pulling the switch out allows normal ignition by the spark plugs.

*c. Governor Control.* The governor control (fig. 2-1) is mounted through the engine housing to the right of the magneto stop switch. It is a screw type mechanism which varies the spring tension on the governor mechanism. Turning the handle counterclockwise increases engine speed. Turning the handle clockwise decreases engine speed.

*d. Oil Pressure Gauge.* The oil pressure gauge (fig. 2-2) is mounted on the engine housing directly above the governor control. It indicates if the engine is developing oil pressure. The oil pressure is normal when the needle points to ON.

*e. Low Oil Pressure Cut-Off Switch.* The low oil pressure cut-off switch (fig. 2-3) is mounted on the engine housing directly above the oil pressure gauge. This switch grounds the ignition system if the engine oil pressure falls below the safe level.

*f. Choke Control.* The choke control (fig. 2-1) is mounted on the engine housing to the right of the governor control. It is a push-pull control which varies the fuel to air ratio. Pulling the choke control out restricts the air to provide a richer fuel mixture for starting a cold engine.

*g. Oil Level Indicator.* The oil level indicator is a graduated sabre type indicator which is mounted through the crankcase on the magneto side of the engine. It is located directly below the oil filler cap.

*h. High Temperature Safety Switch.* The high temperature safety switch (fig. 4-15) is mounted on the cylinder head opposite the No. 4 spark plug. If the cylinder head temperature at the spark plug reaches 570°F, the switch will short

out the magneto and stop the engine. The engine can be restarted after the engine has cooled.

*i. Emergency Ground Switch.* The emergency ground switch (fig. 2-1) is mounted on the lower side of the magneto. Depressing the button stops the engine.

*j. Fuel Shut-Off Valve.* The fuel shut-off valve (1, fig. 4-5) is mounted below the rear operator's platform in the line between the fuel strainer and the engine. Turning the valve handle stops the fuel flow.

*k. Primer Control.* The primer control (8, fig. 4-6) is mounted through the engine housing above the water pump. It is a push-pull control which operates the fuel pump manually to fill the carburetor bowl.

*l. Hand Crank.* The hand crank (fig. 2-1) is normally stored on the side of the engine housing. It is used to manually start the engine.

## 2-9. Water Distribution Controls and Instruments

*a. Inlet Valve.* The inlet valve (fig. 2-2) is mounted on the tee which is installed in the suction port of the water pump. When this valve is open, water flows from the water tank to the pump. When this valve is closed, an outside water source must be used for the pumping operation.

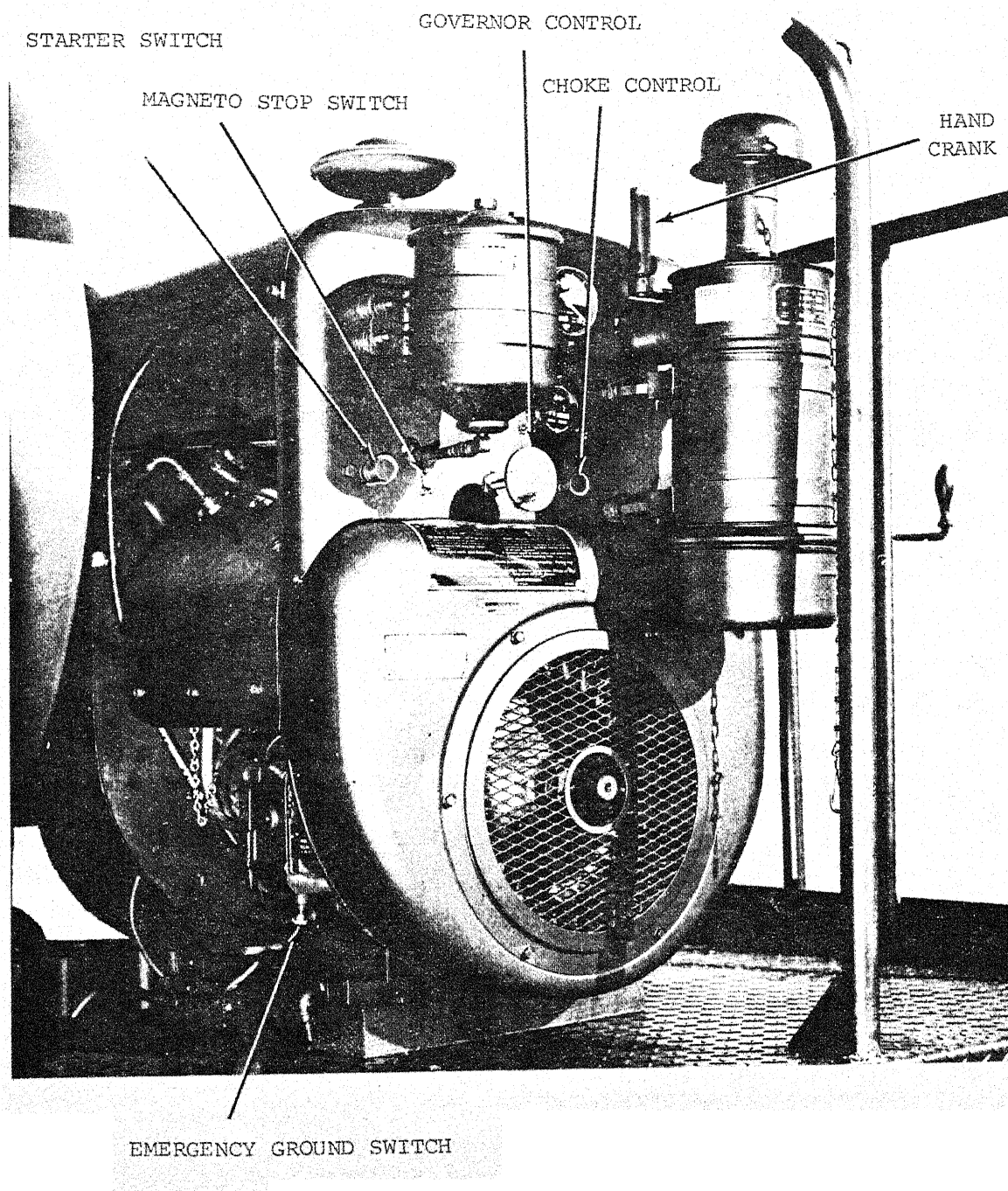
*b. By-Pass Valve.* The by-pass valve (fig. 2-2) is mounted on the tee below the water pump. Opening this valve allows water to drain from the tank for gravity feed of the spraybar. The water tank may be filled by the output of the water pump when this valve is opened. When this valve is closed, output of the water pump by-passes the water tank.

*c. Water Pump Pressure Gauge.* The water pump pressure gauge (fig. 2-2) is mounted above the discharge port of the water pump. It measures the pressure in PSI of the pump output.

*d. Spraybar Valves.* The spraybar valves (fig. 2-2) are mounted in the tee below the by-pass valve. These valves control the flow to each spraybar.

*e. Spraybar Take-Up Crank.* The take-up crank (fig. 2-2) is located at the rear of the operator's platform. Turning the handle raises or lowers the spraybar. A total vertical adjustment of 10 inches is possible.

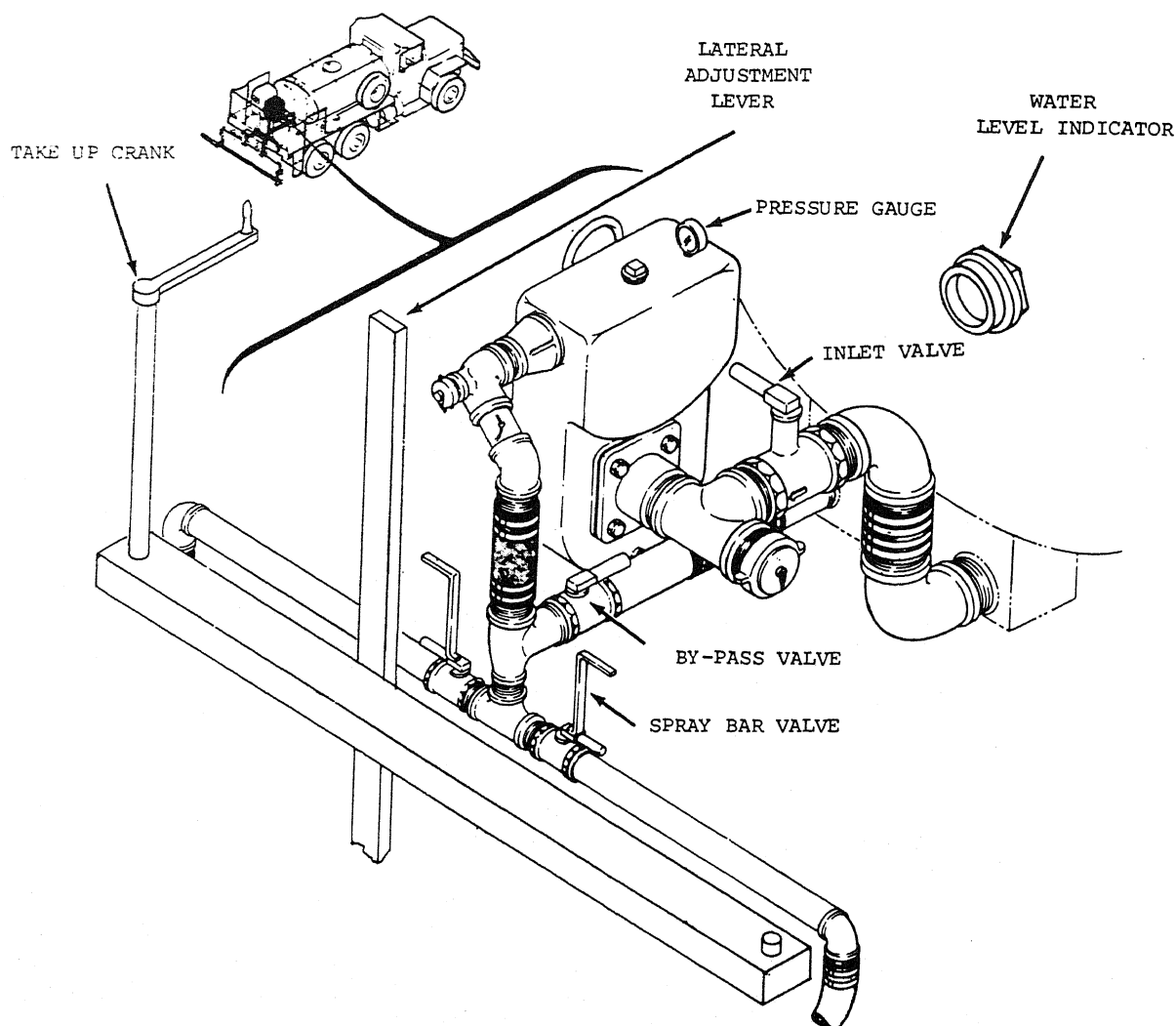
*f. Spraybar Lateral Adjustment Lever.* The lateral adjustment lever (fig. 2-2) is located forward of the take-up crank. Pushing the lever to the left or right moves the spraybar to the



MEC 3825-223-12/2-1

*Figure 2-1. Engine controls and instruments.*





MEC 3825-223-12/2-2

Figure 2-2. Water distribution controls and instruments.

right or left. A total lateral adjustment of 7 inches is possible.

g. *Tank Water Level Gauge.* The tank water level gauge (fig. 2-2) is mounted on the rear of the water tank. It indicates the amount of water and from 0 to 1000 in 25

Controls and

bitu-  
(fig.  
ash

panel in the truck cab and measures the speed of the truck in feet per minute. The bitometer drive is cantilever mounted to the bottom of the truck frame. It may be raised or lowered from inside the truck cab by a rod which comes through the floorboard. A notched support secures this rod in either the raised or lowered position.

b. *Driver Controls and Instrument.* Refer to TM 9-2320-211-10 for the location and operation of the controls and instruments which pertain to the M61A2 truck. An emergency flasher control has been added for use by the driver and is not covered by TM 9-2320-211-10. It is operated by

a two position switch which is mounted to the bottom of the instrument panel. When actuated, this switch flashes the stop lights and front turn signals in unison.

c. *Signal Bell.* A signal bell is mounted on the left forward end of the water tank. Pull cords are attached to the actuating mechanism and may be operated by either the driver or the operator.

## Section IV. OPERATION UNDER USUAL CONDITIONS

### 2-11. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the Model 1602 Water Distributor.

b. The operator must know how to perform every operation of which the water distributor is capable. This section gives instructions on starting and stopping the pumping unit, operation of the water distributor, and on coordinating the basic motions to perform the specific task for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

c. The instructions for the proper operation of the M61A2 truck are given in TM 9-2320-211-10.

### 2-12. Starting the Pumping Unit

a. *Preparation for Starting.*

(1) Perform the preventive maintenance services given in table 3-1.

(2) Lubricate the water distributor in accordance with current Lubrication Orders.

b. *Starting.* Refer to figure 2-3 and start the pumping unit.

### 2-13. Stopping the Pumping Unit

a. Refer to figure 2-4 and stop the pumping unit.

b. Perform the after-operation services (table 3-1).

### 2-14. Operation of Equipment

a. *Operating as a Sprayer.*

(1) Fill the water tank per figure 2-5.

(2) Determine the correct length for the spraybar by referring to the water Application

Chart (table 1-1). Add the required one foot or two foot extensions to either or both ends of the spraybar. The spraybar extensions are mounted into a quick disconnect coupling on the spraybar which is actuated by an over-center cam.

(3) Determine the method of delivering water. Water may be sprayed by gravity feed or by force feed using the pumping unit. Set the control valves in the distribution piping for the desired method of deliver by using figure 2-6 as a guide.

(4) Begin the water distribution by using the following procedure.

(a) Start the pumping unit (fig. 2-3).

(b) If water is to be delivered by force feed, regulate the pump pressure by adjusting engine speed until pump pressure is compatible with Application Chart (table 1-1).

(c) Ring signal gong to direct truck operator to lower the bitumeter wheel assembly and start the truck.

(d) Before movement of the truck, the operator will adjust the index pointer of the bitumeter to recommended speed as given in the Application Chart (table 1-1). The truck operator will accelerate the truck until the bitumeter needle coincides with the pointer.

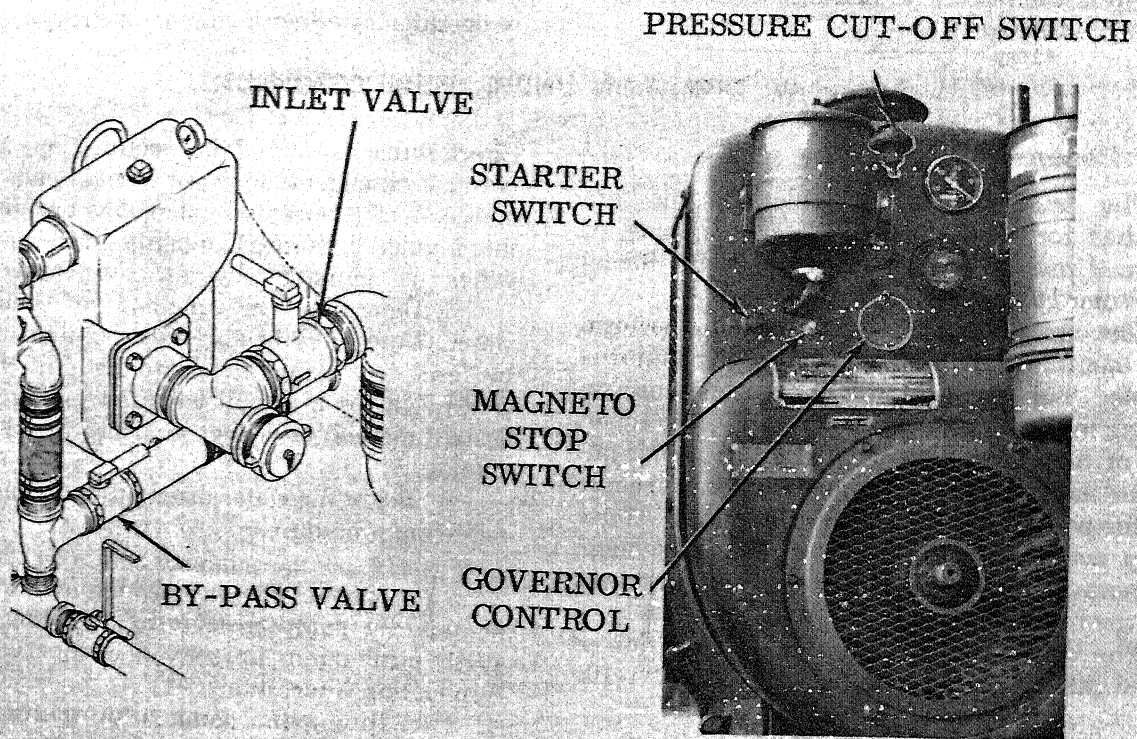
**Caution.** Do not speed, make sharp turns or back-up the truck when the bitumeter wheel is down.

(e) When the area to be sprayed is reached, the operator will adjust the control valves per figure 2-6.

(5) When the spraying operation is completed, turn the spraybar control valves to OFF, lift the bitumeter wheel assembly to the transport position and stop the pumping unit.

b. *Transfer Pumping.* Refer to paragraph 2-4a.

c. *Fire Fighting.* Refer to paragraph 2-4b.



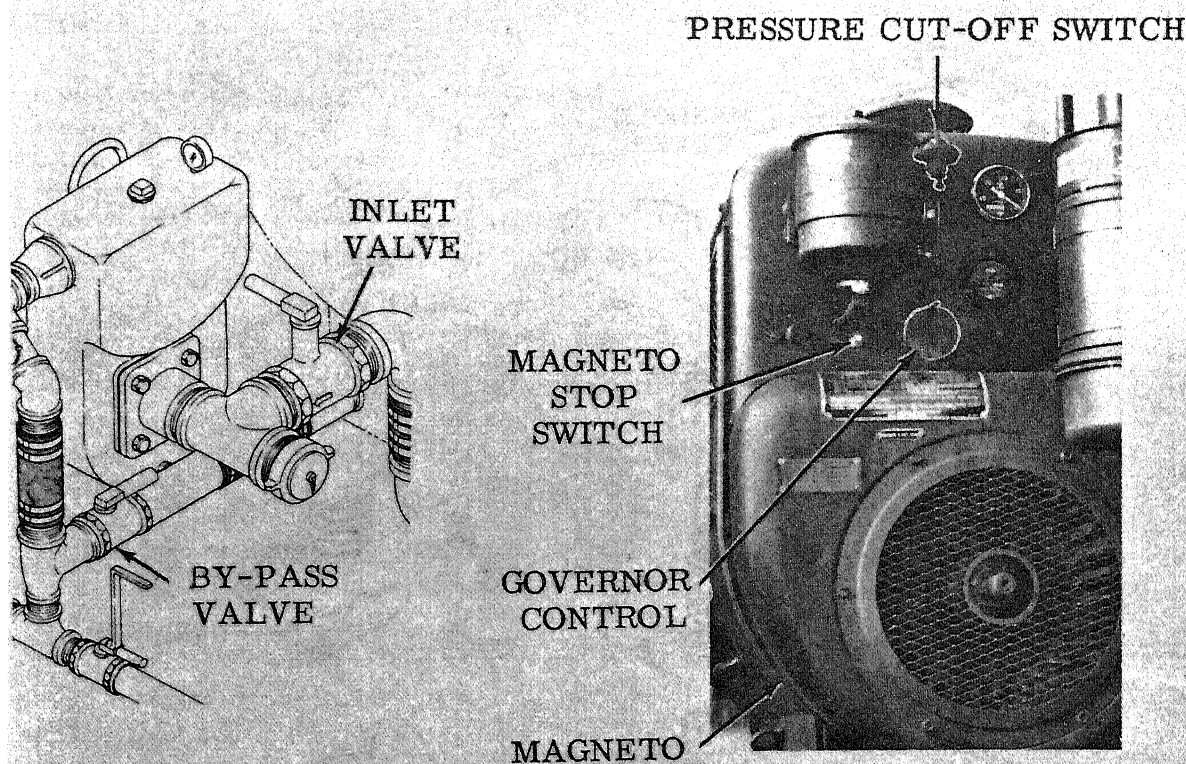
### STARTING THE ENGINE

1. OPEN INLET AND BY-PASS VALVE.
  2. PULL OUT MAGNETO STOP SWITCH.
  3. PULL DOWN ON OIL PRESSURE CUTOFF SWITCH AND DEPRESS STARTER SWITCH.
  4. RELEASE STARTER SWITCH WHEN ENGINE STARTS. RELEASE CUTOFF SWITCH WHEN GAUGE INDICATES PRESSURE.
  5. ADJUST GOVERNOR CONTROL TO DESIRED ENGINE SPEED.
- COMMERCIAL 60156  
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MEC 3825-223-12/2-3

Figure 2-3. Starting the engine.





# STOPPING THE ENGINE

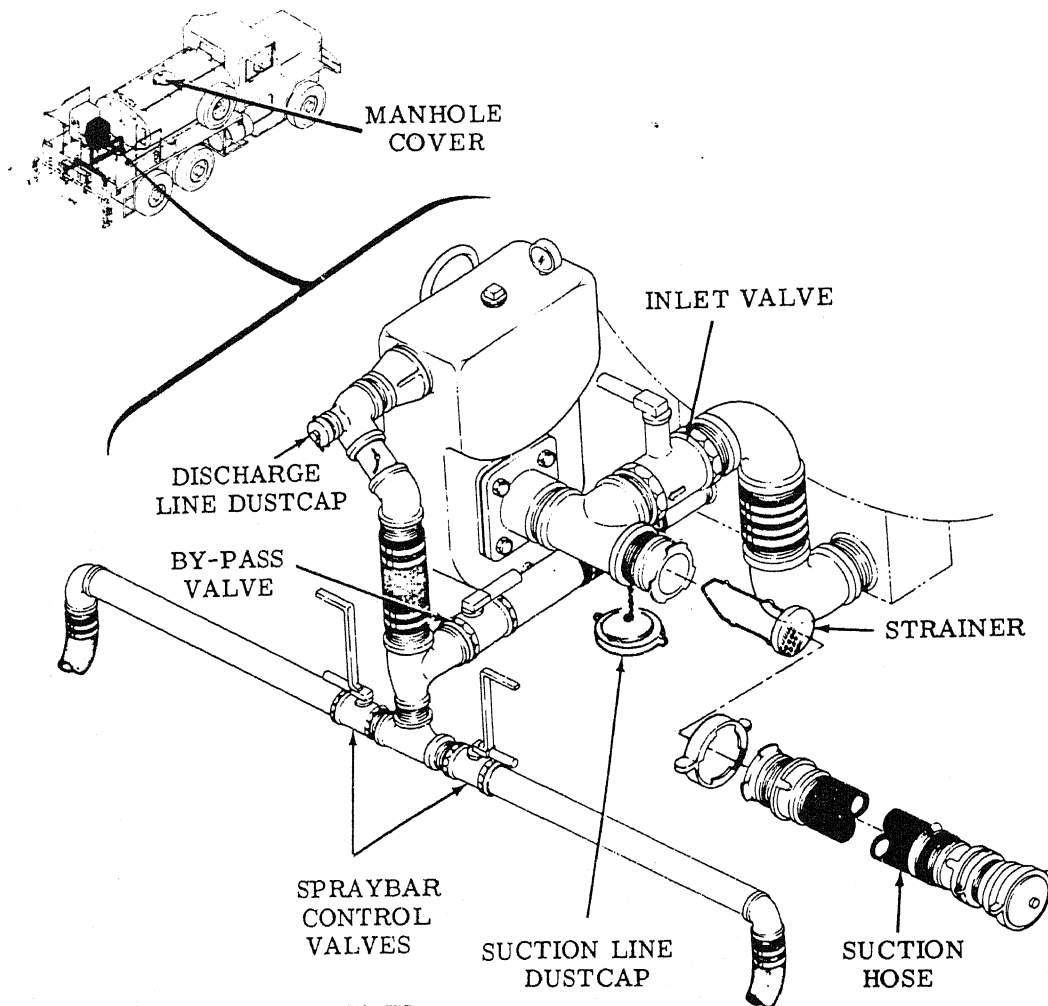
1. TURN GOVERNOR CONTROL TO IDLE POSITION AND ALLOW THE ENGINE TO IDLE THREE MINUTES.
2. DEPRESS MAGNETO STOP SWITCH. IF ENGINE FAILS TO STOP, DEPRESS PRESSURE CUTOFF SWITCH.
3. AFTER ENGINE STOPS, CLOSE BY-PASS AND INLET VALVES.

clockwise

CI

MEC 3825-223-12/2-4

Figure 2-4. Stopping the engine.



#### GRAVITY FILLING OF WATER TANK

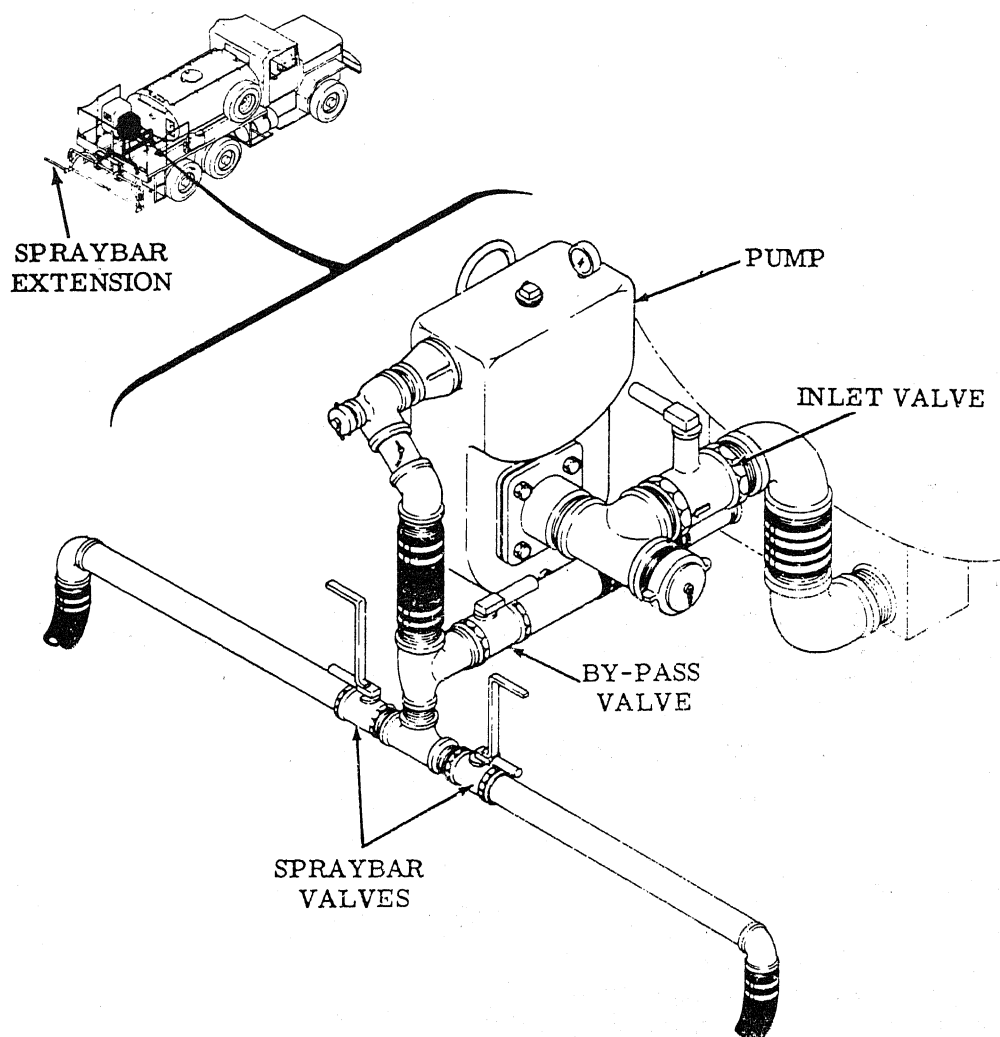
1. CLOSE SPRAYBAR CONTROL VALVES.
2. INSTALL DUST CAPS.
3. OPEN MANHOLE COVER AND FILL TANK.
4. SECURE MANHOLE COVER WHEN FULL.

#### PRESSURE FILLING WITH PUMPING UNIT

1. CLOSE INLET VALVE.
2. REMOVE SUCTION LINE DUST CAP.
3. CLEAN STRAINER IF REQUIRED.
4. ATTACH SUCTION HOSE TO SUCTION INLET.
5. OPEN BY-PASS VALVE.
6. CLOSE SPRAYBAR CONTROL VALVES.
7. START ENGINE. (SEE FIGURE 2-3.) RUN ENGINE UNTIL TANK IS FULL.
8. STOP ENGINE.
9. CLOSE BY-PASS VALVE.
10. DISCONNECT SUCTION HOSE AND INSTALL DUST CAP.

MEC 3825-223-12/2-5

Figure 2-5. Filling the water tank.



#### SPRAYING BY GRAVITY FEED

1. FILL THE WATER TANK (SEE FIGURE 2-5).
2. OPEN BY-PASS AND SPRAYBAR VALVES AND BEGIN SPRAYING.

#### SPRAYING WITH PUMPING UNIT

1. FILL THE WATER TANK (SEE FIGURE 2-5).
2. OPEN INLET AND BY-PASS VALVES.
3. START THE ENGINE (SEE FIGURE 2-3).
4. OPEN SPRAYBAR VALVES AND CLOSE BY-PASS VALVE TO COMMENCE SPRAYING.

MEC 3825-223-12/2-6

*Figure 2-6. Operating as a sprayer.*

## Section V. OPERATION UNDER UNUSUAL CONDITIONS

### 2-15. Operation in Extreme Cold

The water distributor is not intended for use in extreme cold. If emergency use is required for fire fighting or transfer pumping, all water must be drained from the system immediately after completion of the mission.

### 2-16. Operation in Extreme Heat

No special precautions are required for operation in extreme heat. Care should be taken to prevent the engine from overheating. The cooling air intake should be free from obstructions and the housing doors may be removed to aid in cooling air circulation.

### 2-17. Operation in Dusty or Sandy Areas

No special precautions are required for operation in dusty or sandy areas. Filters and strainers in the engine oil, fuel and air systems should be serviced frequently. The strainer in the water pump should be cleaned after each mission.

### 2-18. Operation in High Humidity or Salt Water Areas

No special procedures are required to compensate for high humidity. The fuel tanks should be maintained at the full level to reduce the condensation of water vapor within the tanks during inactive periods. In salt water areas, special attention should be given to condition of the painted surfaces of the water distributor. Chipped or cracked painted surfaces should be repainted to prevent the formation of rust. Parts which are not protected by paint or plating should be coated with a standard rust proof coating.

### 2-19. Operation in High Altitudes

No special precautions are required for operation in high altitudes. If engine performance appears to be affected, use a higher octane gasoline.

## Section VI. OPERATION OF AUXILIARY MATERIAL USED IN CONJUNCTION WITH THE EQUIPMENT

### 2-20. Fire Hose and Nozzle

*a. Description.* The fire hose is a 25-foot length of 1 1/2 inch canvas hose. It is normally stored in a rack on the right side of the operator's platform. The nozzle is a nonadjustable solid-stream type. It is normally stored in the tool box located on the left side of the truck immediately behind the truck cab.

*b. Operation of the Fire Hose and Nozzle.* Remove the fire hose and nozzle from the storage positions. Refer to figure 2-7 for proper operation procedures. After use of the fire hose, allow the hose to dry completely before returning it to the storage rack.

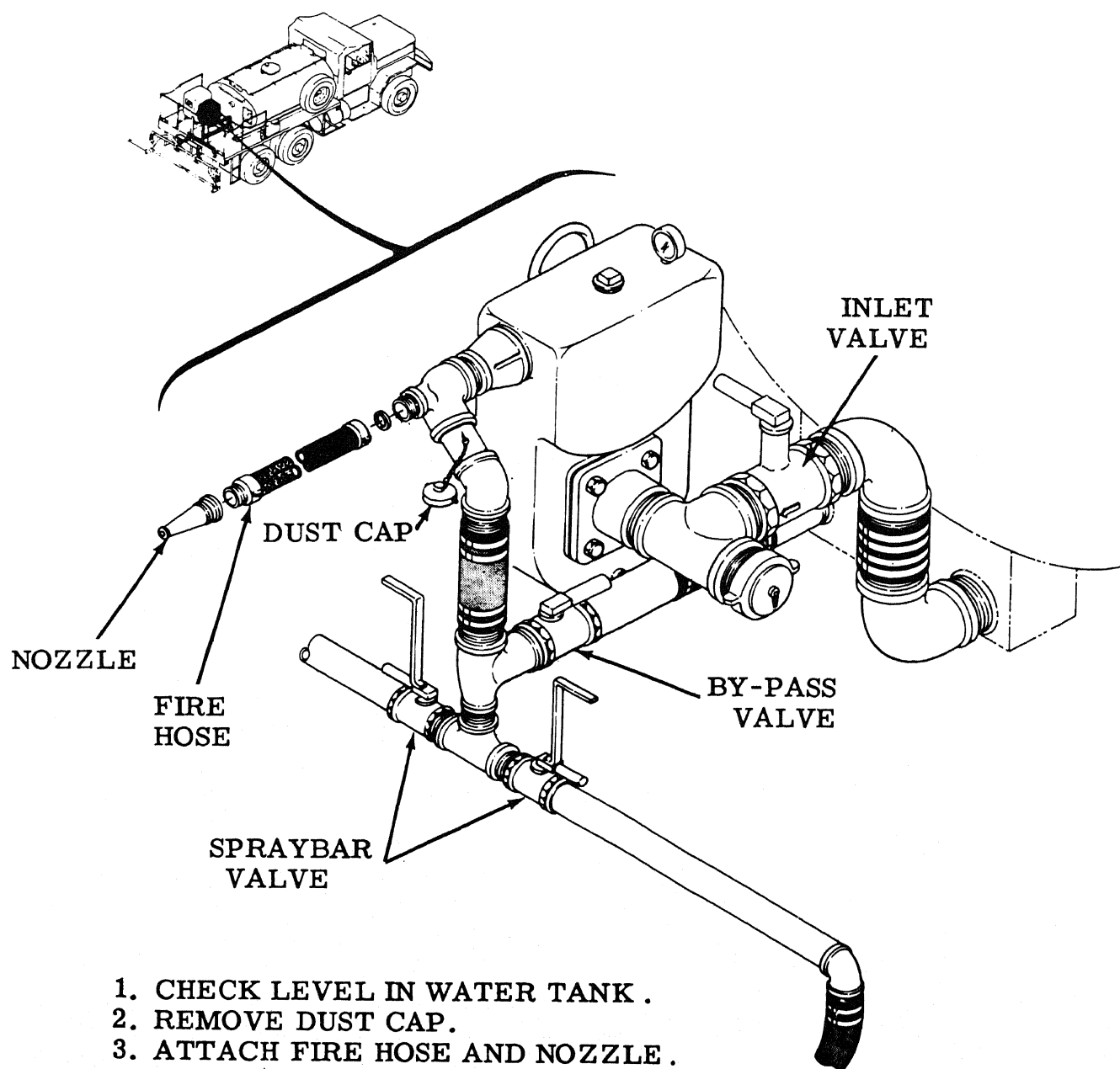
### 2-21. Fire Extinguisher (Dry Chemical Type)

*a. Description.* The dry chemical type fire extinguisher is suitable for use on all types of fire

and is effective in areas where ambient temperature is 25°F. and above. If winterized, (pressurized with nitrogen) the fire extinguisher may be used in temperatures below -25°F. The fire extinguisher is a 2 1/2 pound, stored pressure, level-operated extinguisher.

*b. Operation.* Remove the fire extinguisher from its location, lift the handle, press lever, and direct the powder at the base of the flame using a side-to-side sweeping motion.

*c. Maintenance.* Weigh the fire extinguisher every 6 months and replace the extinguisher if weight is less than 4 1/2 pounds, or if pressure is below 125 pounds. Refer to TB 5-4200-200-10. The dry chemical fire extinguisher will be serviced at installation level through Repair and Utilities facilities, with the filling agent supplied by local procurement through Troop Supply Channels.



1. CHECK LEVEL IN WATER TANK .
2. REMOVE DUST CAP.
3. ATTACH FIRE HOSE AND NOZZLE .
4. CLOSE SPRAYBAR AND BY-PASS VALVES .
5. OPEN INLET VALVE AND START ENGINE.

MEC 3825-223-12/2-7

*Figure 2-7. Operating fire hose.*





## CHAPTER 3

### OPERATOR/CREW MAINTENANCE INSTRUCTIONS

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#### Section I. BASIC ISSUE ITEMS

##### 3-1. Special Tools

There are no special tools or equipment required to perform the repair, maintenance or overhaul operations on the Model 1602 Water Distributor.

##### 3-2. Operator/Crew Maintenance Tools, Equipment and Repair Parts

Tools, equipment and repair parts issued with and authorized for the Water Distributor are listed in the Basic Issue Items List, appendix C.

#### Section II. LUBRICATION INSTRUCTIONS

##### 3-3. General Lubrication Information

a. This paragraph contains lubrication instructions which are supplemental to, and not specifically covered in the lubrication order.

b. For the current approved lubrication order (L.O.) refer to DA Pam 310-4.

##### 3-4. Detailed Lubrication Information

a. *General.* Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready for use.

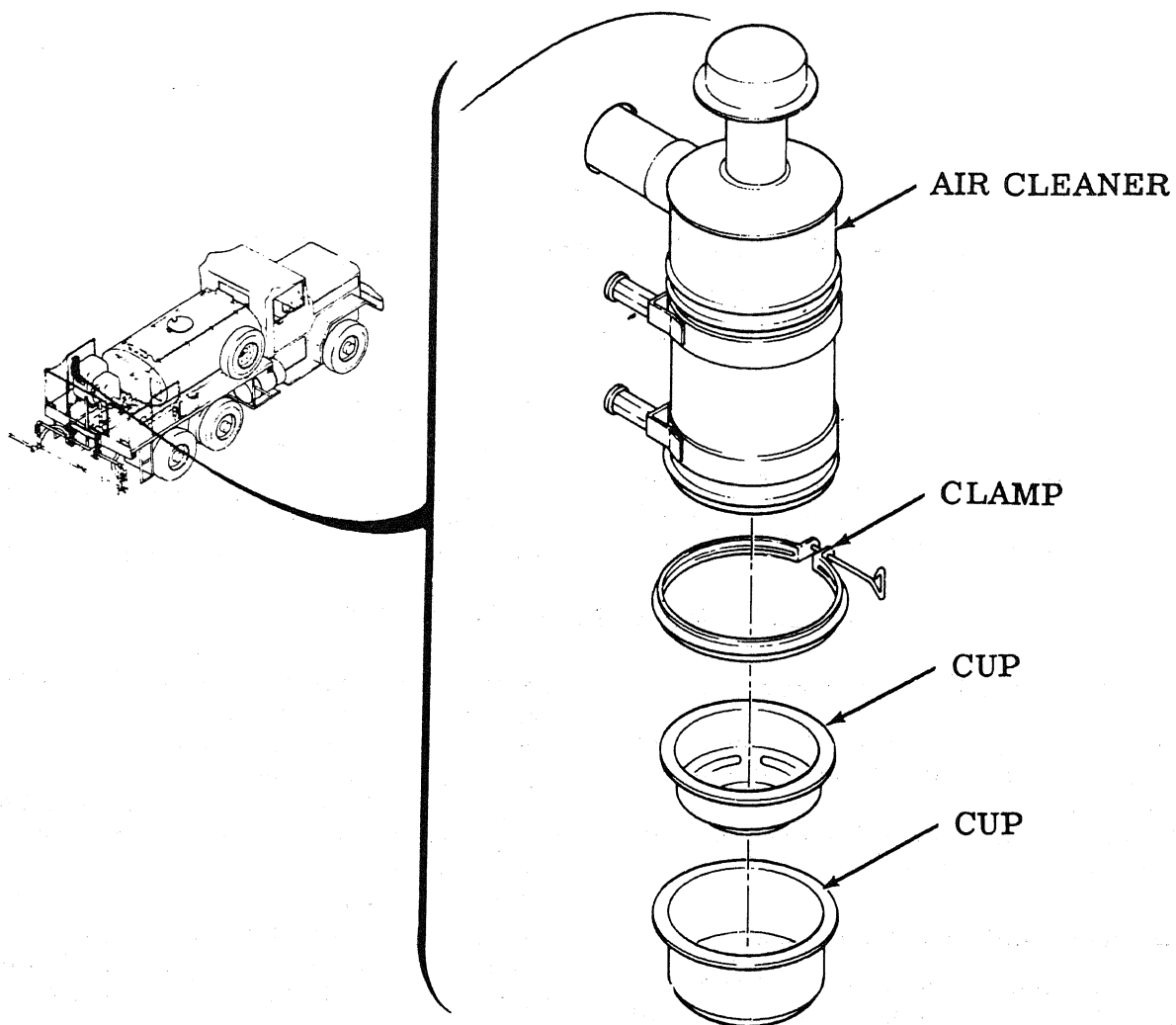
b. *Cleaning.* Keep all external parts not requiring lubrication clean of lubricants. Before

lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. *Points of Lubrication.* Service the lubrication points at proper intervals as illustrated in the current L.O.

d. *Servicing Air Cleaner.* Service intervals and the correct grade of lubricant to service the air cleaner are prescribed in the current lubrication order. To service the air cleaner, refer to figure 3-1.

e. *Servicing Oil Filter.* Service intervals and the correct grade of lubricant to service the oil filter are prescribed in the current lubrication order. To service the oil filter, refer to figure 3-2.

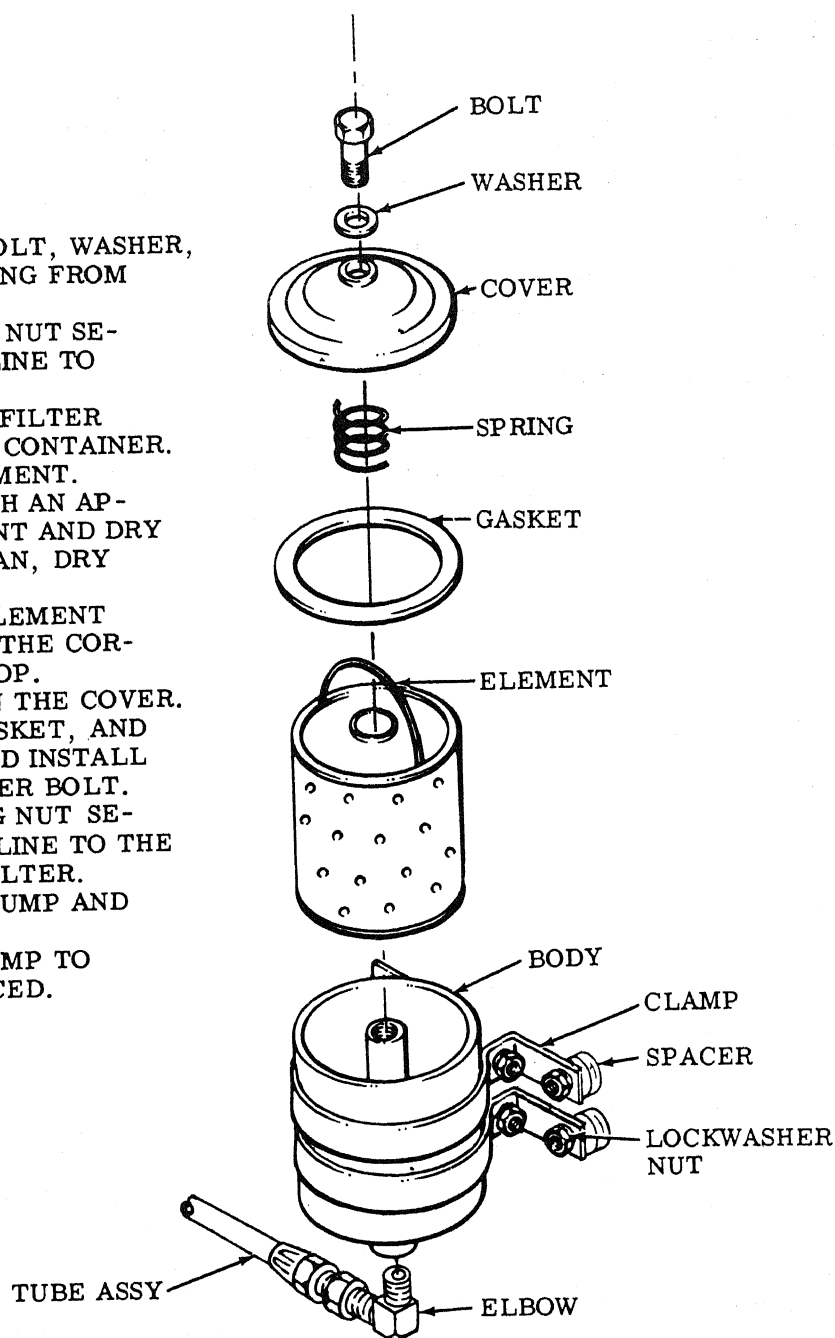


1. LOOSE THE CLAMP SECURING THE OIL CUP TO THE AIR CLEANER.
2. DISPOSE OF THE OIL IN THE OIL CUP.
3. CLEAN THE OIL CUP WITH A CLOTH DAMPENED WITH AN APPROVED CLEANING SOLVENT AND DRY THOROUGHLY.
4. FILL THE OIL CUP TO THE OIL LEVEL MARK.
5. POSITION THE OIL CUP ON THE AIR CLEANER AND SECURE THE CLAMP.

MEC 3825-223-12/3-1

*Figure 3-1. Servicing the air cleaner.*

1. REMOVE THE SHOULDER BOLT, WASHER, COVER, GASKET, AND SPRING FROM THE OIL FILTER.
2. REMOVE THE CONNECTING NUT SECURING THE OUTLET OIL LINE TO THE OIL FILTER.
3. DRAIN THE OIL FROM THE FILTER HOUSING INTO A SUITABLE CONTAINER.
4. REMOVE THE FILTER ELEMENT.
5. WASH THE OIL FILTER WITH AN APPROVED CLEANING SOLVENT AND DRY THOROUGHLY WITH A CLEAN, DRY CLOTH.
6. INSTALL A NEW FILTER ELEMENT BEING CAREFUL TO FACE THE CORRECT END TOWARD THE TOP.
7. INSTALL A NEW GASKET IN THE COVER.
8. POSITION THE SPRING, GASKET, AND COVER ON THE FILTER AND INSTALL THE WASHER AND SHOULDER BOLT.
9. INSTALL THE CONNECTING NUT SECURING THE OUTLET OIL LINE TO THE ELBOW FITTING IN THE FILTER.
10. START THE ENGINE AND PUMP AND INSPECT FOR LEAKS.
11. STOP THE ENGINE AND PUMP TO REPAIR ANY LEAKS NOTICED.



MEC 3825-223-12/3-2

Figure 3-2. Servicing the oil filter.

### Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

#### 3-5. General

To insure that the Water Distributor is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed and described in paragraph 3-6. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during

operation which would damage the equipment if operation were continued. All deficiencies and short-comings will be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

#### 3-6. Preventive Maintenance Checks and Services

Operator's daily and weekly preventive maintenance checks and services are given in table 3-1. Refer to this table for the interval and scope of these checks.

Table 3-1. Preventive Maintenance Checks and Services

Item number	Interval				B-Before operation D-During operation	A-After operation W-Weekly	M-Monthly Q-Quarterly
	Operator		Org.				
	Daily		M	Q			
	B	D	A	W			
					Item to be inspected	Procedure	Reference
1	X				Engine oil supply	Check oil level with oil sabre. Add oil to maintain at FULL mark.	Para 2-8g
2	X		X		Engine fuel supply	Remove fuel tank cap and check fuel level. Fill as required.	Para 2-8j
3	X				Air cleaner	Check level of oil in cup. Add oil to maintain at FULL level.	Figure 3-1
4	X				Water pump strainer	Clean with recommended solvent and dry.	Figure 2-5
5	X				Fire extinguisher	Inspect for broken seal.	Para 2-21
6	X				Light assemblies	Check operation of all lights. Replace defective lens or lamps.	See TM 9-2320-211-10
7		X			Oil pressure gauge	Observe gauge for proper indication. Stop engine immediately if loss of pressure.	Para 2-8d

## Section IV. TROUBLESHOOTING

### 3-7. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the Water Distributor and its components. Information for diagnosis and remedial action to the M61A2 truck chassis is contained in TM 9-2320-211-20. Malfunctions which may occur in the Water Distributor are listed in table

3-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

### 3-8. Troubleshooting

For troubleshooting information that is applicable to the operator, refer to Table 3-2.

Table 3-2. Troubleshooting

Malfunction	Probable causes	Corrective action
1. Engine fails or hard to start	a. Lack of fuel b. Fuel shutoff valve closed c. Engine flooded by too much fuel	a. Fill fuel tank. b. Open the shutoff valve. c. Crank engine with throttle wide open, or let the engine sit for a few minutes and repeat the starting operation.
2. Engine misses or runs erratically	a. Empty fuel tank b. Water in fuel c. Excess of foreign matter in fuel strainer	a. Fill fuel tank. b. Drain fuel system and fill with fuel. c. Remove sediment bowl, empty it and replace it.
3. Engine knocks or develops excessive noise	a. Improper grade of fuel b. Governor not set properly for existing load c. Engine operating under heavy load d. Ignition timing advanced too far	a. Drain and fill the fuel tank with the proper grade of fuel. b. Refer to organizational maintenance. c. Turn engine with hand crank, with ignition off, to determine excessive load due to unusual cause. d. Report to organizational maintenance.
4. Engine stops	a. Lack of fuel	a. Fill fuel tank.

Table 3-2. Troubleshooting—Continued.

Malfunction	Probable causes	Corrective action
5. Engine oil pressure low	b. Faulty ignition	b. Report or organizational maintenance.
	c. Erratic fuel flow	c. Report to organizational maintenance.
	a. Oil level low	a. Fill crankcase to specified level with proper grade of oil. Refer to current L.O.
6. Engine overheats	b. Oil too light	b. Check for diluted oil and replace with proper grade.
	a. Oil level low	a. Replenish the oil supply. Refer to current L.O.
	b. Air shrouding removed or obstructed	b. Report to organizational maintenance.
	c. Engine idles too slowly	c. Report to organizational maintenance.
7. Pump fails to prime or deliver rated capacity	d. Magneto spark improperly timed	d. Report to organizational maintenance.
	a. Suction valve set incorrectly	a. Move the suction line lever to open.
	b. Suction strainer clogged	b. Remove and clean strainer.
	c. Loose suction line connections	c. Report to organizational maintenance.
8. Little or no water from spraybar	d. Suction check valve defective	d. Report to organizational maintenance.
	a. Spraybar valves not set properly	a. Set spraybar valves correctly.
	b. Defective valves	b. Report to organizational maintenance.

## Section V. MAINTENANCE OF WATER DISTRIBUTOR

### 3-9. Truck Maintenance

The maintenance procedures authorized for the operator or crew level for the truck chassis are given in TM 9-2320-211-10.

### 3-10. Pumping Unit

a. The maintenance procedures authorized for the operator or crew level are limited to the

servicing requirements provided in section III of this chapter. Malfunctions or deficiencies are to be reported to Organizational Maintenance.

b. Replace the pump strainer using figure 2-5 as a guide.

c. Replace the oil filter cartridge using figure 3-2 as a guide.

## CHAPTER 4

### ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

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#### Section I. SERVICE UPON RECEIPT OF MATERIAL

##### 4-1. Inspecting and Servicing the Equipment

- a. Inspect and service the truck chassis in accordance with TM 9-2320-211-20.
- b. Perform the preventive maintenance services given in table 4-1.

##### 4-2. Installation of Separately Packed Components

There are no separately packed components.

The water distributor is shipped completely assembled and ready for operation.

##### 4-3. Installation or Setting-Up Instructions

No special procedures are required for setting up of the water distributor. Remove any packing or tape which was used for shipping.

##### 4-4. Equipment Conversion

For equipment conversion, refer to chapter 2.

#### Section II. MOVEMENT TO A NEW WORK SITE

##### 4-5. Dismantling for Movement

No special procedures are required for movement to a new work site. A check should be made to see that the suction hose and spraybar extensions are secured to the truck. The bitu-

meter should be raised for transport.

##### 4-6. Reinstallation After Movement

No special procedures are required. Check for items damaged or lost during movement.

#### Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

##### 4-7. Repair Parts, Special Tools and Equipment

There are no special tools or equipment required to perform the repair, maintenance or overhaul operations on the Model 1602 Water Distributor.

##### 4-8. Maintenance Repair Parts

Organizational maintenance repair parts for the Distributor are listed and illustrated in TM 5-3825-223-20P (when printed). For the M61A2 Truck Chassis repair parts, refer to TM 9-2320-211-20P.

#### Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

##### 4-9. General

To insure that the Water Distributor is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed and described in paragraph 4-10. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon

as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and short-comings will be recorded together with the corrective action taken on DA Form 2404 at the earliest possible opportunity.

##### 4-10. Preventive Maintenance Services

Organizational preventive maintenance checks and services are given in table 4-1. Refer to this table for the interval and scope of these checks.



Table 4-1. Preventive Maintenance Checks and Services

Item number	Interval				M Q	Item to be inspected	A-After operation W-Weekly	M-Monthly Q-Quarterly
	Operator		Org.					
	Daily		M	Q				
	B	D						
	B	D	A	W		Procedure	Reference	
1				X	Engine oil	Drain oil from engine oil sump and replace with recommended oil.	Current L.O.	
2				X	Air cleaner	Drain oil from air cleaner and replace with recommended oil.	Current L.O.	
3				X	Fire extinguisher	Inspect for proper charge or broken seal.	Para 2-21	
4				X	Cooling system	Clean out any debris. Inspect for damaged or missing parts.	Para 4-19	
5				X	Flywheel	Inspect for broken or missing blades or teeth.	Para 4-19	
6				X	Engine controls and instruments	Inspect starter switch, high temperature safety switch, magneto stop switch, low oil pressure shutoff switch, governor control and gauges for proper operation.	Para 4-20 thru 4-26	
7				X	Fuel lines and tank	Inspect for damage to tank or lines. Replace damaged parts.	Para 4-28	
8				X	Starter	Inspect brushes for wear. Replace as required.	Para 4-33	
9				X	Spark plugs	Inspect for proper gap.	Para 4-35	
10				X	Magneto	Inspect for proper gap.	Para 4-34	
11				X	Valve tappets	Inspect for proper gap.	Para 4-39	

## Section V. TROUBLESHOOTING

### 4-11. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the Water Distributor and its components. Information for diagnosis and remedial action to the M61A2 truck chassis is contained in TM 9-2320-211-20. Malfunctions which may occur in the Water Distributor are

listed in table 4-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

### 4-12. Troubleshooting Table

Refer to table 4-2 for troubleshooting information.

Table 4-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Engine knocks or develops excessive noise	a. Governor not set properly for existing load b. Defective oil pump c. Ignition timing advanced too far d. Loose connecting rod	a. Adjust governor setting. (para 4-25) b. Report to direct support maintenance. c. Adjust magneto timing. (para 4-34) d. Report to general support maintenance.
2. Engine stops	a. Faulty ignition b. Erratic fuel flow	a. Check magneto. (para 4-34) b. Check feed to carburetor.
3. Engine oil pressure low	a. Defective oil pump b. Restricted oil lines	a. Report to direct support maintenance. b. Report to direct support maintenance.

Table 4-2. Troubleshooting—Continued.

Malfunction	Probable cause	Corrective action
4. Engine overheats	a. Air shrouding removed or obstructed	a. Replace air shrouding and remove obstruction. (para 4-19)
	b. Engine idles too slowly	b. Adjust the idle speed. (para 4-30)
	c. Magneto spark improperly timed	c. Adjust magneto timing. (para 4-34)
5. Pump fails to prime or deliver rated capacity	a. Loose suction line connections	a. Check and tighten all connections. (para 4-41)
	b. Suction check valve defective	b. Report to direct support maintenance.
	c. Defective pump	c. Report to direct support maintenance.
	d. Damaged or impaired impeller	d. Report to direct support maintenance.
	e. Air leak at pump shaft seal	e. Report to direct support maintenance.
6. Little or no water from spraybar	a. Defective water pump	a. Report to direct support maintenance.
	b. Defective valves	b. Replace valves. (para 4-42)

## Section VI. RADIO INTERFERENCE SUPPRESSION

### 4-13. General Methods Used to Obtain Proper Suppression

Essentially, suppression is obtained by providing a low resistance to ground for the stray currents. The methods used to attain suppression includes: shielding the ignition and high frequency wires, grounding the frame with bounding straps, and using capacitors and resistors. For general information on radio suppression, refer to TM 11-483.

### 4-14. Interference Suppression Components

a. *Primary Suppression Components.* The primary suppression components are those whose primary function is to suppress radio interference. These components are described and located in figure 4-1.

b. *Secondary Suppression Components.* These

components have radio interference suppression functions which are incidental or secondary to their primary function.

### 4-15. Replacement of Suppression Components

Refer to figure 4-1 and replace defective radio interference suppression components.

### 4-16. Testing of Radio Interference Suppression Components

Test the capacitors for leaks and shorts on a capacitor tester; replace defective capacitors. If test equipment is not available and interference is indicated, isolate the cause of interference by the trail and error method of replacing components in turn until the cause of interference is located and eliminated.

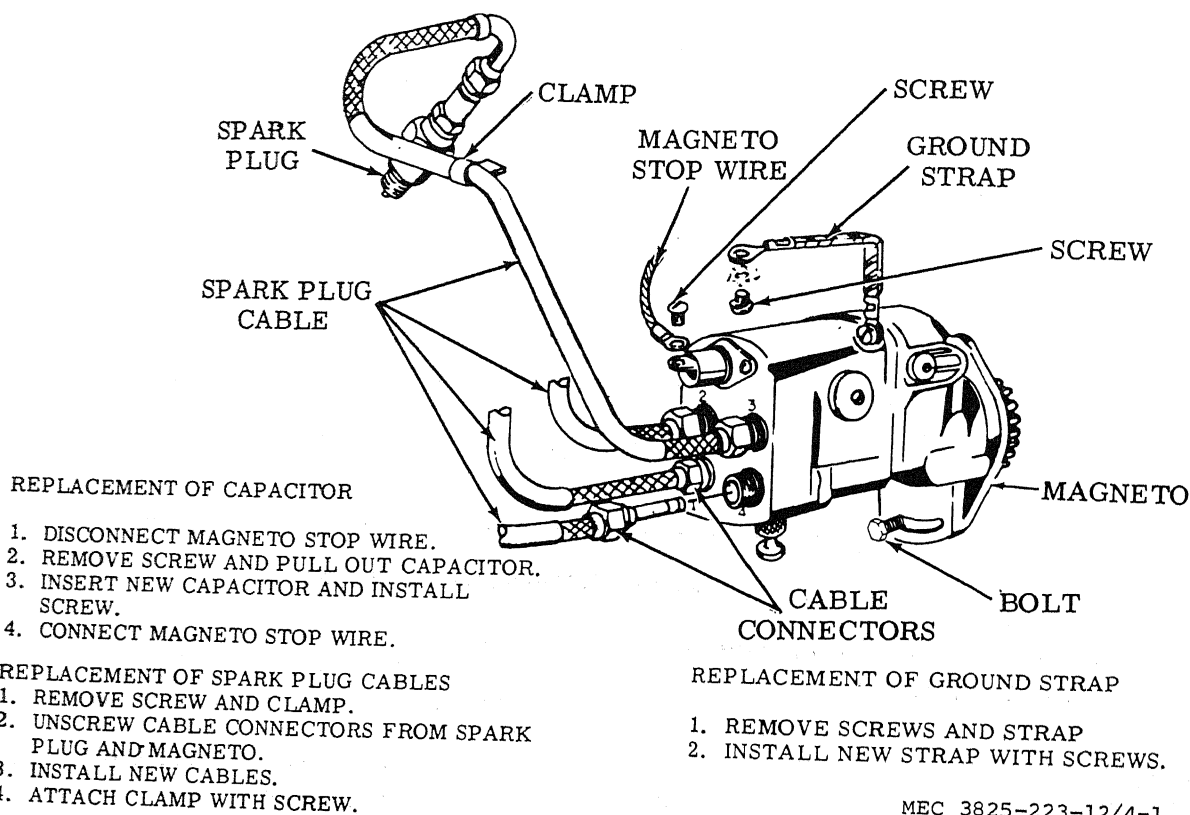


Figure 4-1. Radio suppression components.

## Section VII. MAINTENANCE OF ENGINE HOUSING AND COOLING SYSTEM

### 4-17. General

The engine is enclosed in a sheet metal housing. Doors at both sides provide access to adjustment points. A top canopy, rear housing panel, flywheel housing and a front panel compose the rest of the housing. Sheet metal shrouds and deflectors direct the cooling air past the cylinders.

### 4-18. Hood, Doors, Shields and Panels

#### a. Removal. Refer to figure 4-2.

- (1) Unscrew and remove the muffler (1).
- (2) Turn the retainer and remove the doors (2).
- (3) Remove eleven nuts, lockwashers and screws (3). Remove the top canopy (4). Remove four nuts, washers and screws (5) and separate the partition plate (6) from the top canopy (4).

(4) Disconnect the choke wire (7) from the carburetor. Disconnect and tag the oil pressure hose from the gauge (8), low pressure cutoff switch (9) and oil filter (10).

(5) Disconnect the air cleaner hose (11) from the air cleaner.

(6) Disconnect the governor control (12) at the control lever on the engine. Disconnect tachometer (13).

(7) Disconnect and tag electrical wires to the starter switch (14), magneto ground switch (15), hourmeter (16) and the low oil pressure cutoff switch (9).

(8) Remove nine screws (17), lockwashers and nuts to remove the front panel (18) with gauges and accessories.

#### b. Cleaning, Inspection and Repair.

(1) Clean all metal parts in dry cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

(2) Inspect top canopy, front panel, partition plate, braces and doors for damage. Straighten bent or dented parts. Replace parts damaged beyond repair.

(3) Inspect hardware for stripped or damaged threads. Replace damaged hardware.

*c. Reassembly.*

(1) Install front panel on flywheel shroud and secure to braces with screw, lockwashers and nuts.

(2) Connect electrical wires and oil pressure hoses which were removed during disassembly.

(3) Connect hose to air cleaner.

(4) Connect choke cable to carburetor butterfly valve and secure setscrew. Connect governor control to control lever.

(5) Install partition plate on top canopy and install top canopy on engine.

(6) Install muffler.

#### 4-19. Cowling, Deflectors, Flywheel and Shrouds

*a. Removal.* Refer to figure 4-3.

(1) Remove housing. Refer to paragraph 4-18.

(2) Remove six screws (1), lockwashers (2) and flywheel screen (3).

(3) Drive out pin (4) and remove nut (5) and lockwasher (6). Pull the flywheel (7) from the crankshaft. Remove the key (8).

*Note.* The flywheel is mounted on a taper on the crankshaft. Take a firm hold on the flywheel fins, pull outward and at the same time, strike the end of the crankshaft with a rubber or rawhide mallet.

**Caution:** Do not strike the crankshaft with a steel hammer as it may ruin the crankshaft and bearings.

(4) Remove the screws (9), lockwashers (10) and cylinder head shrouds (11 and 12). Remove the screws (13 and 14), lockwashers (15) and flywheel shroud (16). Remove the screws (17), lockwashers (18) and lower shroud (19). Remove the screws (20), lockwashers (21) and heat deflector (22).

*b. Cleaning, Inspection and Repair.*

(1) Clean all metal parts in dry cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

(2) Inspect screen, shrouds and deflectors for damage. Straighten bent or dented parts. Replace parts damaged beyond repair.

(3) Inspect hardware for damaged or stripped threads. Replace damaged hardware.

*c. Reassembly.*

(1) Position lower shroud and heat deflector on engine and secure with screws and lockwashers.

(2) Install flywheel shroud on engine and secure with screws and lockwashers.

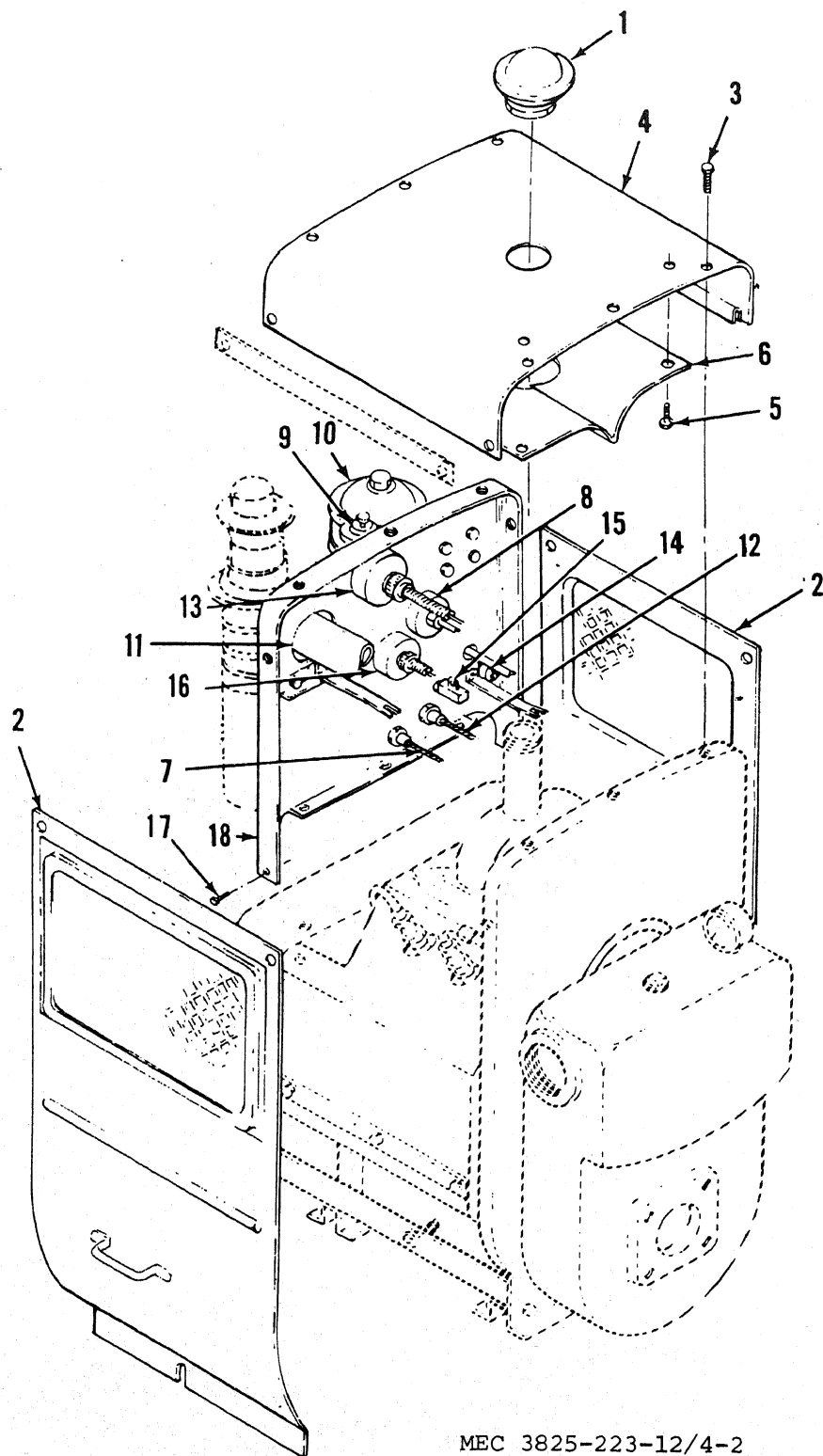
(3) Install cylinder head shrouds with screws and lockwashers.

(4) Align flywheel with keyway on crankshaft and install key. Tighten washer and nut on crankshaft until flywheel is seated on taper of crankshaft. Install pin.

*Note.* Pin (4, fig. 4-3) should be centered in crankshaft.

(5) Install flywheel screen with screws and lockwashers.

(6) Install housing (para 4-18).



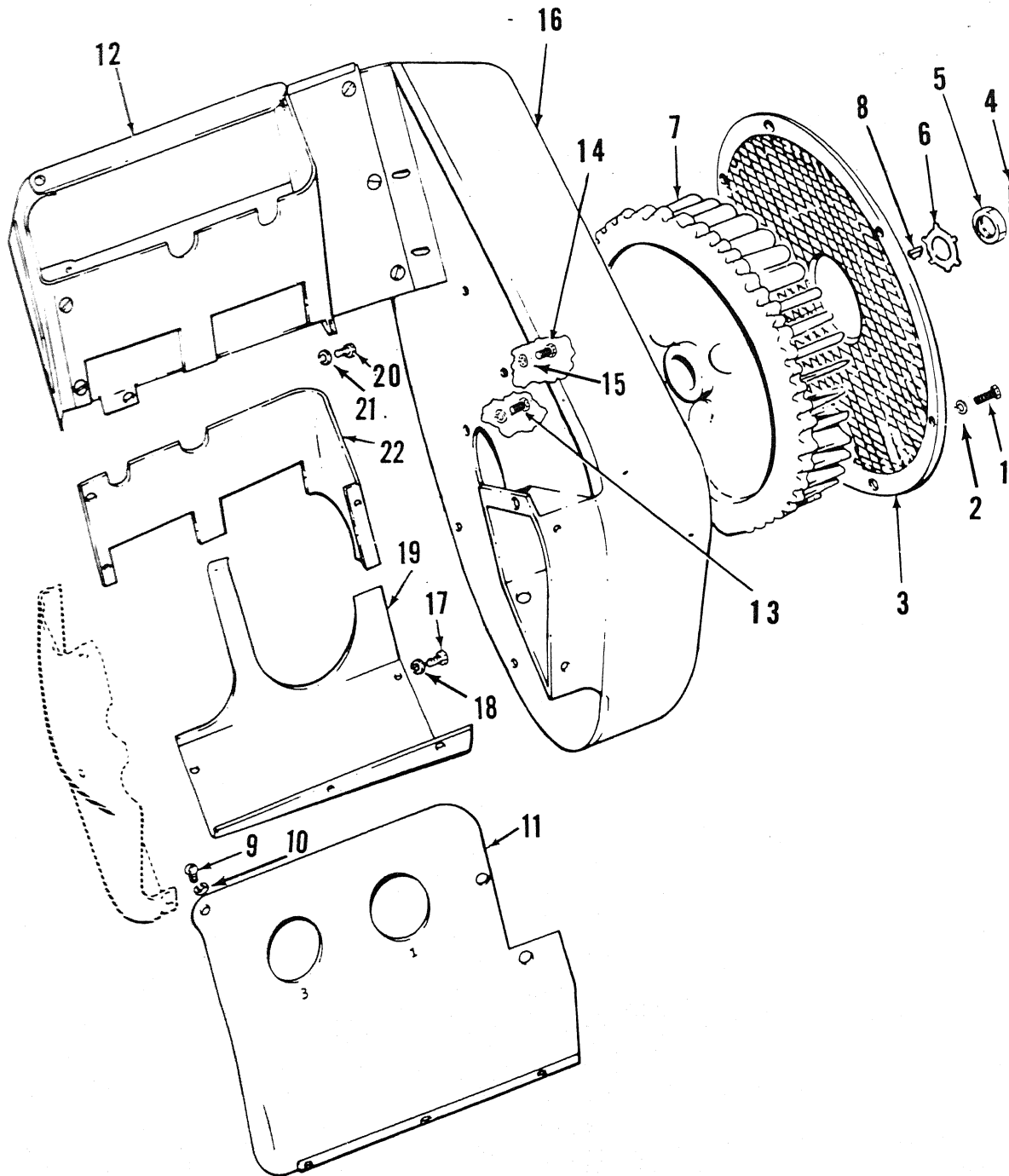
MEC 3825-223-12/4-2

Figure 4-2. Engine housing, disassembly and reassembly.

- |                               |                      |
|-------------------------------|----------------------|
| 1. Muffler                    | 10. Oil filter       |
| 2. Door                       | 11. Hose             |
| 3. Screw                      | 12. Governor control |
| 4. Top canopy                 | 13. Tachometer       |
| 5. Screw                      | 14. Starter switch   |
| 6. Partition plate            | 15. Ground switch    |
| 7. Choke wire                 | 16. Hourmeter        |
| 8. Gauge                      | 17. Screw            |
| 9. Low pressure cutoff switch | 18. Front panel      |

Figure 4-2—Continued.

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Figure 4-3. Engine cooling system, disassembly and reassembly.

- |                |                        |
|----------------|------------------------|
| 1. Screw       | 12. Shroud (assembled) |
| 2. Lockwasher  | 13. Screw              |
| 3. Screen      | 14. Screw              |
| 4. Pin         | 15. Lockwasher         |
| 5. Nut         | 16. Shroud             |
| 6. Lockwasher  | 17. Screw              |
| 7. Flywheel    | 18. Lockwasher         |
| 8. Key         | 19. Shroud             |
| 9. Screw       | 20. Screw              |
| 10. Lockwasher | 21. Lockwasher         |
| 11. Shroud     | 22. Heat deflector     |

Figure 4-3—Continued.

## Section VIII. MAINTENANCE OF ENGINE CONTROLS AND INSTRUMENTS

### 4-20. General

The controls and instruments for the operation of the pumping unit engine are mounted on the front panel of the engine. These controls and instruments are shown in figure 2-1.

### 4-21. Starter Switch

*a. Description.* The starter switch is a spring loaded, push-type switch. Pushing the button completes an electrical circuit from the battery to the starter. Because the switch is a one-piece unit, it must be replaced if defective.

*b. Testing.* If the starter motor fails to operate, short the switch by placing a screwdriver across the terminals at the back of the starter switch. If the starter motor operates, the switch is defective and must be replaced.

*c. Removal.* Refer to figure 4-4.

(1) Remove the battery cable and the starter cable (1) from the terminals on the back of the starter switch (2).

(2) Remove the two bolts (3), nuts (4) and lockwashers (5) holding the starter switch to the front panel and remove the switch.

*d. Installation.* Position the starter switch in the engine front panel mounting hole and secure with two bolts (3), nuts (4) and lockwashers (5).

### 4-22. High Temperature Safety Switch

*a. Description.* The high temperature safety switch is a temperature sensing unit that shuts off an overheating engine automatically. The sensing unit is fastened to the cylinder head. A wire runs from the switch to the magneto. The switch is not repairable and must be replaced as a unit.

*b. Removal.*

(1) Disconnect the switch wire by pulling

the clip connector from the terminal.

(2) Unscrew the cylinder head capscrew. Remove the washer and lift off the switch.

*c. Installation.*

(1) Position the switch on the cylinder head and secure with the washer and capscrew.

(2) Connect the switch wire by installing the clip connector on the switch terminal.

### 4-23. Magneto Stop Switch and Wire

*a. Description.* The magneto stop switch is a pull-pull switch. It grounds the magneto, thereby stopping the engine. Because the switch is a one-piece unit, it must be replaced if defective. The stop switch wire leads from the rear of the stop switch to the magneto.

*b. Removal.* Refer to figure 4-4.

(1) Remove the screw securing stop switch wire to the rear of magneto stop switch (6) and screw securing stop switch wire to magneto and remove wire.

(2) Remove nut securing stop switch (6, fig. 4-4) to front panel and remove stop switch.

*c. Installation.*

(1) Position magneto stop switch (6) in front panel and secure with nut.

(2) Secure magneto stop switch wire to rear of stop switch with screw and to magneto with screw.

### 4-24. Low Oil Pressure Shutoff Switch

*a. Removal.* Refer to figure 4-4.

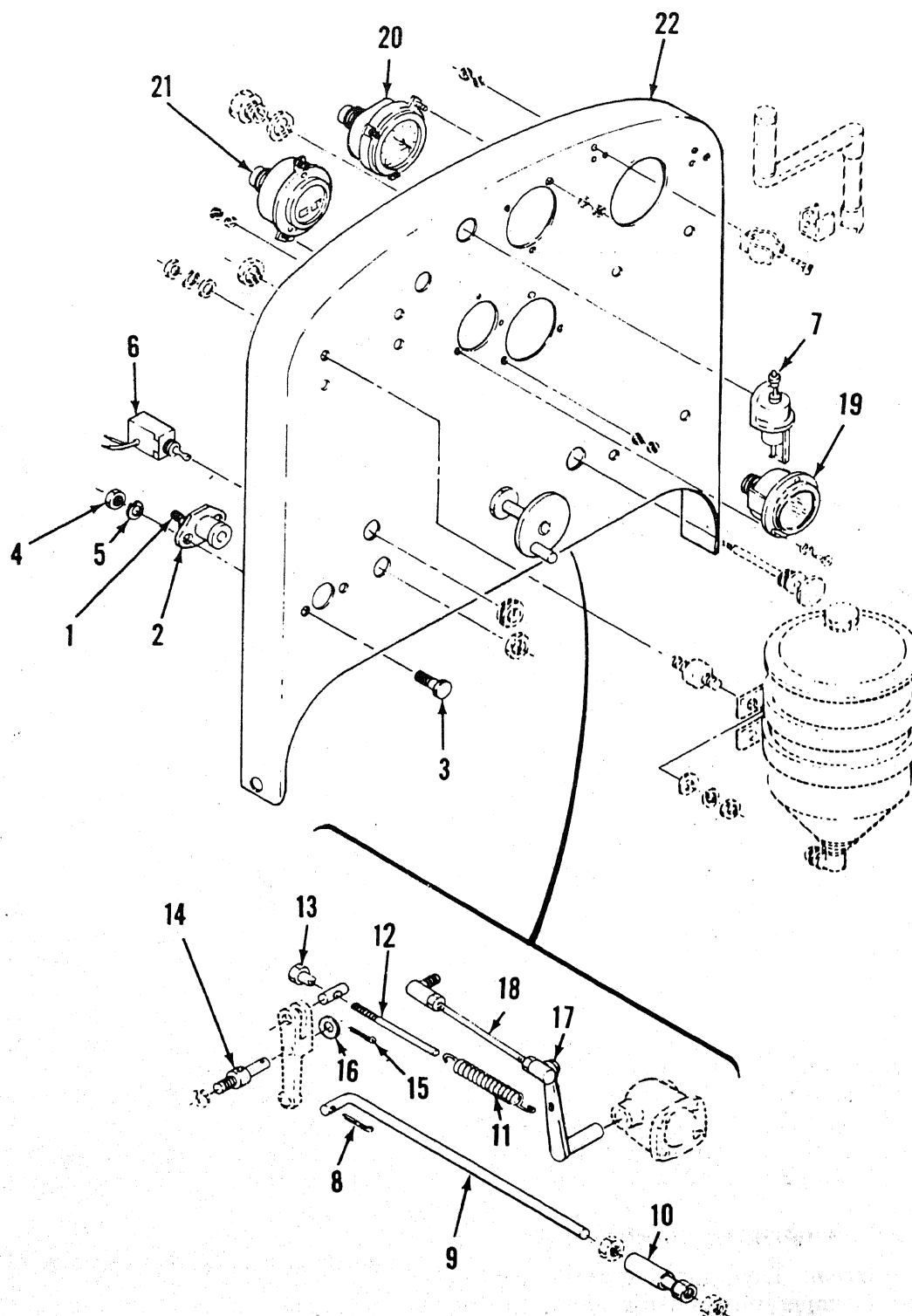
(1) Unscrew knurled nut (7) and remove wire from stop of switch.

(2) Remove nut securing oil line to rear of switch and remove switch.

*b. Installation.*

(1) Position switch on front panel. Secure oil line to rear of switch with nut.





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Figure 4-4. Instruments and controls.

1. Cable
2. Starter switch
3. Bolt
4. Nut
5. Lockwasher
6. Magneto stop switch
7. Nut
8. Cotter pin
9. Rod
10. Swivel
11. Spring

12. Adjusting screw
13. Nut
14. Pin
15. Cotter pin
16. Washer
17. Nut
18. Control rod
19. Oil pressure gauge
20. Tachometer
21. Hourmeter
22. Front panel

Figure 4-4—Continued.

(2) Position wire on switch and secure with knurled nut.

#### 4-25. Governor Control

*a. Description.* The governor control is a screw type mechanical linkage which varies the spring tension on the governor arm. Turning the handle counterclockwise increases the spring pull on the governor lever and thus increases the engine speed.

*b. Removal and Disassembly.* Refer to figure 4-4.

(1) Remove cotter pin (8). Loosen check nut and unscrew rod (9). Loosen check nut and remove swivel fitting (10).

(2) Unhook spring (11) from governor lever and remove from adjusting screw. Remove adjusting screw (12) and nut (13).

(3) Remove pin (14) with lever by unscrewing from block. Remove cotter pin (15), washer (16) and lever.

(4) Remove nut (17), washer and control rod (18) from governor lever.

*c. Reassembly and Adjustment.* Reassemble the governor control in the reverse order of disassembly. Adjust the length of the adjusting screw using the following procedure.

(1) Check the length of the control rod from the governor to the carburetor. With the engine at rest, move the governor lever and control rod towards the carburetor. At the maximum position, the throttle plate should be full open and about 1/16 inch from the throttle stop. Adjust as required.

(2) Attach the governor spring to the governor lever through the 10th hole from the bottom of the governor lever.

(3) Turn the governor control to the idle position and start the engine (fig. 2-3). Increase engine speed gradually to 2400 rpm. If engine will not reach 2400 rpm, shorten adjustment screw (12, fig. 4-4). If engine runs faster than 2400 rpm when governor control is turned to the maximum, lengthen adjustment screw. Shorten or lengthen screw by turning the adjustment screw nut.

tion and start the engine (fig. 2-3). Increase engine speed gradually to 2400 rpm. If engine will not reach 2400 rpm, shorten adjustment screw (12, fig. 4-4). If engine runs faster than 2400 rpm when governor control is turned to the maximum, lengthen adjustment screw. Shorten or lengthen screw by turning the adjustment screw nut.

#### 4-26. Oil Pressure Gauge, Hourmeter and Tachometer

*a. Description.* The oil pressure gauge, hourmeter and tachometer are mounted on the front panel. Since the engine lubricating system operates at a low pressure, the oil pressure gauge is not calibrated. It indicates either "OFF" or "ON". The hourmeter is an electrically wound mechanical clock which registers the engine operating time in actual hours. The tachometer is mechanically driven by the governor and measures the revolutions per minute of the engine. The tachometer also registers the effective lapsed time of engine operation based on constant service at 2400 rpm.

*b. Removal.* Disconnect oil pressure line, tachometer cable or electrical line (para 4-18a). Remove attaching hardware and remove gauge (fig. 4-4).

*c. Cleaning Inspection and Repair.*

(1) Wipe with cloth dampened with cleaning solvent (Federal Specification P-D-680) and dry with a clean, lintless cloth.

(2) Inspect instrument for damage.

(3) Replace damaged gauge, hourmeter or tachometer.

*d. Installation.* Install gauge, hourmeter or tachometer in the reverse order of removal.

## Section IX. MAINTENANCE OF ENGINE FUEL SYSTEM

## 4-27. General

a. The fuel system consists of a fuel tank, strainer, shutoff valve, fuel pump, carburetor and necessary lines and fittings. The fuel system is controlled by a centrifugal weight governor.

b. Fuel is drawn from the fuel tank which is located below and behind the engine and passes through a strainer. The strainer removes and collects foreign matter and solids from the fuel. The fuel pump draws fuel from the strainer and forces fuel into the carburetor. The carburetor mixes fuel with air for proper combustion in the cylinder. The carburetor throttle is connected directly to governor.

## 4-28. Fuel Tank, Lines and Fittings

a. *Description.* The fuel supply for the pumping unit is stored in a fuel tank which is mounted below the operator's platform. The cap on the fuel tank is accessible through the platform to the rear of the engine.

b. *Removal.* Refer to figure 4-5.

(1) Close fuel shutoff valve (1) and disconnect fuel line (2) at shutoff valve. Drain fuel into a container.

(2) Open fuel shutoff and drain fuel tank supply into a container.

(3) Remove bolt (3), lockwashers and nuts and lower fuel tank (4) from platform.

(4) Remove shutoff valve, strainer (5) and fuel line fittings.

c. *Cleaning, Inspection and Repair.*

(1) Clean fuel tank, lines and fittings in dry cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

(2) Inspect fuel tank for cracks, broken lugs or other damage. Replace defective tank.

(3) Inspect metal fuel lines for cracks, kinks or other damage.

(4) Inspect rubber fuel lines for cuts, cracks, or deterioration. Replace or repair as necessary.

(5) Inspect fittings for stripped or damaged threads. Replace damaged fittings.

d. *Installation.*

(1) Install strainer and shutoff valve in bottom part of fuel tank.

(2) Mount fuel tank on operator's platform with bolts, nuts and lockwashers.

(3) Install fuel line from tank to fuel pump.

## 4-29. Fuel Pump

a. *Description.* Fuel is drawn from the tank and delivered to the carburetor by a flexible diaphragm type fuel pump. This pump is mounted to the block by a right angle adapter. A plunger housed in the adapter actuates a rocker arm and link assembly which operates the diaphragm. This plunger rides on a cam on the camshaft. A hand priming lever is attached to the adapter and will operate the plunger when the cam is in the low position.

b. *Removal.* Refer to figure 4-6.

(1) Remove the canopy (para 4-18) and fuel lines.

(2) Remove the two capscrews (1) and lockwashers (2) securing the fuel pump and adapter to the crankcase and remove the adapter and gasket.

c. *Disassembly.*

(1) Remove two bolts (3) and lockwashers (4) securing fuel pump (5) to adapter. Remove pump and gasket (6).

(2) Remove the plunger cap and the plunger from the adapter (7).

(3) Remove the priming lever (8) from the shaft (9).

(4) Remove the spring shaft (9) and washer from the adapter.

(5) Remove the preformed packing from the shaft (9).

d. *Cleaning, Inspection and Repair.*

(1) Clean all metal parts in dry cleaning solvent (Federal Specification P-D-680) and dry thoroughly with compressed air.

(2) Wipe the preformed packing clean with a cloth.

e. *Inspection and Repair.*

(1) Inspect all hardware for breaks or damaged threads and replace as necessary.

(2) Inspect the adapter for cracks, breaks, rust or corrosion. Check the gasket surfaces for nicks or burrs and remove any burrs. Repair or replace as necessary.

(3) Inspect all springs for weakness, pitting or rust and replace as necessary.

(4) Inspect the plunger and plunger cap for excessive wearing, burrs, or rust. Remove rust and burrs. Replace worn cap or plunger.

(5) Inspect the priming lever and control lever for cracks or rust. Replace a defective control or priming lever.

(6) Replace the gaskets.

*f. Reassembly.*

(1) Install the preformed packing on the shaft (9).

(2) Install the washer, shaft (9) and spring on the adapter (7).

(3) Install the priming lever (8) in the shaft (9).

(4) Install the plunger and cap in the adapter (7).

(5) Position the gasket (6) on the adapter.

*g. Installation.*

(1) Position a new gasket on the crankcase. Position the fuel pump adapter on the crankcase and secure with two lockwashers (2) and capscrews (1).

(2) Position a new gasket (6) on the fuel pump adapter (7).

(3) Position the fuel pump (5) on the fuel pump adapter and secure with the two lockwashers (4) and bolts (3).

(4) Position the fuel lines on the fuel pump and secure with the two fuel line nuts.

(5) Install the canopy (para 4-18).

#### 4-30. Carburetor and Manifolds

*a. Description.* The carburetor is an updraft single venturi design and is mounted under the intake and exhaust manifold. It has a fixed orifice for metering the fuel and a semi-concentric fuel bowl which allows the engine to operate without starving or flooding in rough terrain.

*b. Removal.* Refer to figure 4-7.

(1) Remove canopy (para 4-18).

(2) Disconnect the governor control rod (1), choke cable (2) and air cleaner hose (3). Loosen and remove fuel line to carburetor.

(3) Remove screws (4) lockwashers (5) and carburetor (6). Separate and discard gasket (7).

*Note.* Carburetor and manifold may be removed as an assembly.

(4) Remove nuts (8), lockwashers and manifold (9). Remove cylinder head shroud and heat deflectors (para 4-19). Remove nut (10), lockwashers and manifold (11).

*c. Cleaning, Inspection and Repair.*

(1) Clean exterior of carburetor and manifolds with dry cleaning solvent (Federal Specification P-C-680) and dry thoroughly.

(2) Inspect machined surfaces of manifolds with a straightedge. Replace warped manifolds. Inspect manifolds for cracks, broken lugs or other damage. Replace damaged manifolds.

(3) Inspect carburetor for condition. Replace defective carburetor.

(4) Replace all gaskets.

*b. Installation.*

(1) Position new gaskets on cylinder ports and install lower branch manifold (11) with nuts (10) and lockwashers.

(2) Install cylinder head shroud and heat deflectors (para 4-19).

(3) Position new gasket (7) on carburetor and mount to manifold (9) with screws (4) and lockwashers (5).

(4) Position new gasket on lower branch manifolds and attach carburetor and manifold with nuts and lockwashers.

(5) Connect governor control rod, choke and air cleaner hose (para 4-25).

(6) Install canopy (para 4-18).

*c. Adjustment.*

(1) Adjust governor control rod per paragraph 4-25c.

(2) Insert choke wire in hole in the butterfly valve arm. Position valve to wide open position. Push choke control knob on front panel all the way in and tighten setscrew on choke wire.

(3) There are no adjustments to make on the fuel mixture.

(4) Start engine (fig. 2-3). Turn governor control on front panel to idle position. Turn idle adjusting screw until the engine idles at 600-800 rpm. Stop the engine (fig. 2-4).

#### 4-31. Engine Governor Assembly

*a. Description.* The engine governor operates the carburetor to maintain a constant engine speed regardless of the load on the engine. The governor is operated by centrifugal force acting on a pair of flyweights which act to overcome the spring tension of the governor control. When the centrifugal force exceeds the spring tension, the governor control lever moves to close the carburetor. The governor is housed in the upper part of the timing gear housing and is driven by the camshaft gear.

*b. Removal.* Refer to figure 4-8.

(1) Remove the canopy (para 4-18).

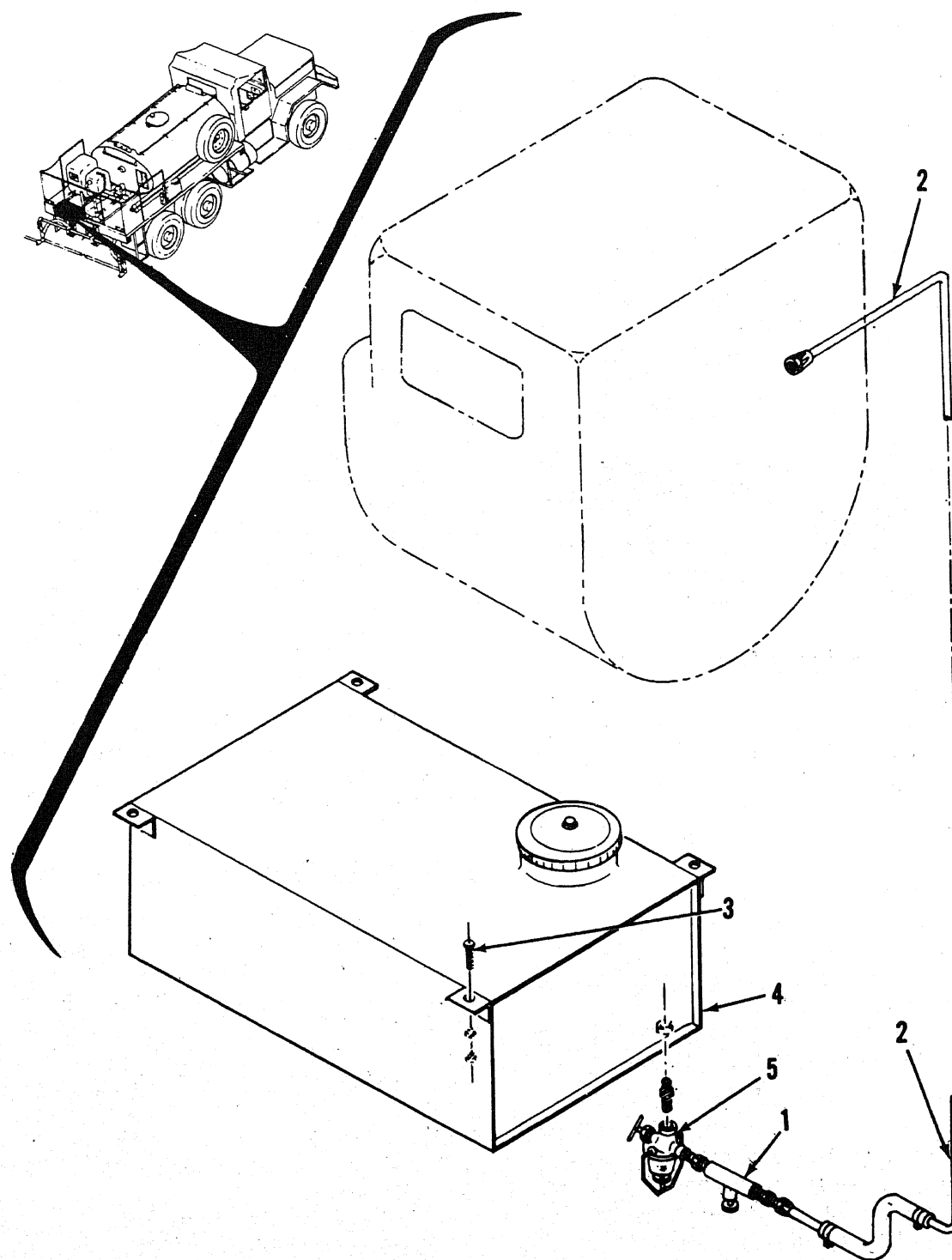
(2) Disconnect the governor controls (para 4-25).

(3) Loosen and remove oil lines (1) to governor (2).

(4) Remove bolts (3), lockwashers (4) and governor (2).

*c. Installation.*

(1) Install governor (2) with bolts (3) and

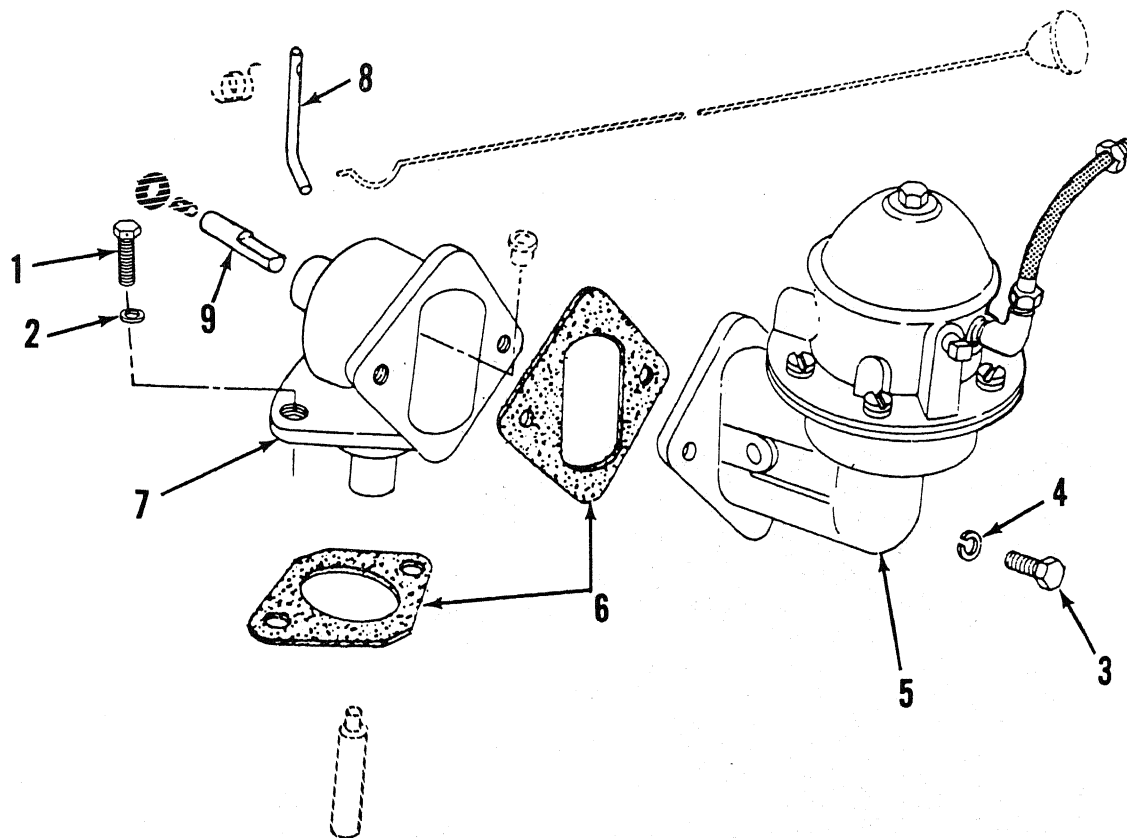


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- 1. Shutoff valve
- 2. Fuel line
- 3. Bolt

- 4. Fuel tank
- 5. Strainer

*Figure 4-5. Fuel tank, lines and fittings.*

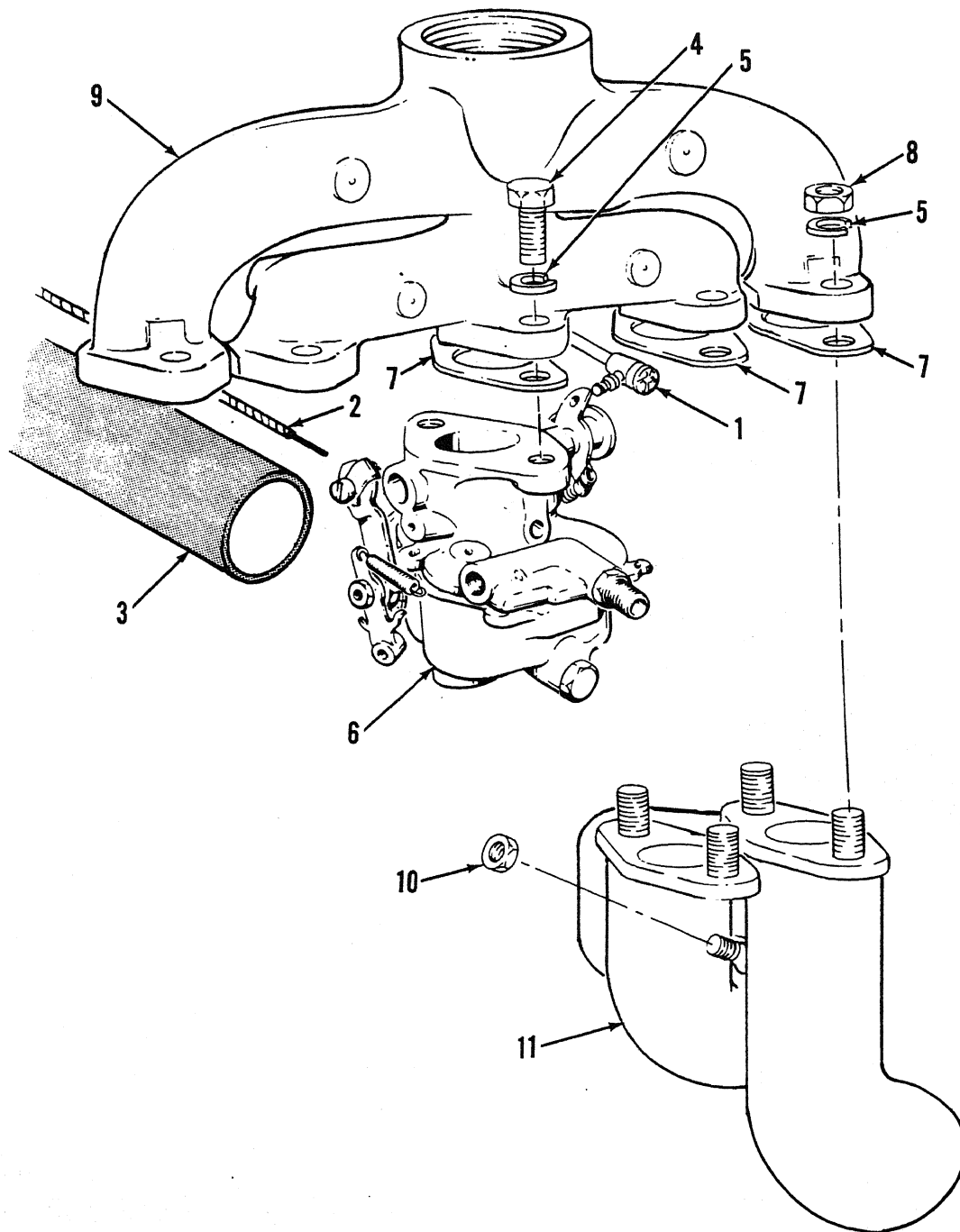


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1. Screw
2. Lockwasher
3. Bolt
4. Lockwasher
5. Fuel pump

6. Gasket
7. Adapter
8. Priming level
9. Shaft

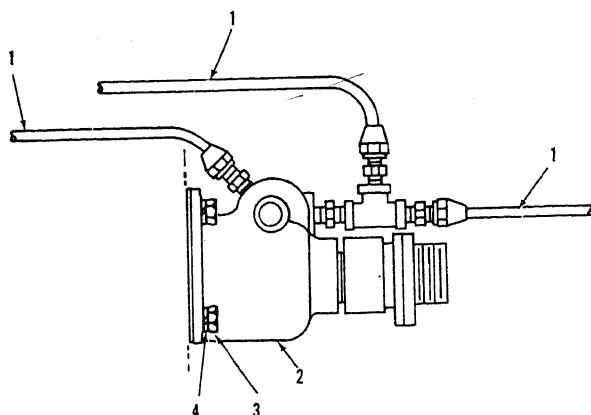
Figure 4-6. Fuel pump and adapter.



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- |                     |              |
|---------------------|--------------|
| 1. Control rod      | 7. Gasket    |
| 2. Choke cable      | 8. Nut       |
| 3. Air cleaner hose | 9. Manifold  |
| 4. Screw            | 10. Nut      |
| 5. Lockwasher       | 11. Manifold |
| 6. Carburetor       |              |

Figure 4-7. Carburetor and manifolds.



1. Oil line
2. Governor

3. Bolts
4. Lockwasher

Figure 4-8. Governor.

lockwashers (4).

- (2) Connect oil line (1) to governor.
- (3) Connect and adjust governor controls (para 4-25).
- (4) Install canopy (para 4-18).

## Section X. MAINTENANCE OF ENGINE ELECTRICAL SYSTEM

### 4-32. General

The electrical system for the pumping unit consists of a starter, magneto, spark plugs, switches and cables. All of the components are radio suppressed. The power supply for this circuit is supplied by the M61A2 truck batteries.

### 4-33. Starter

*a. Description.* The starter motor supplies the necessary amount of torque to crank the engine for short periods of time. It is a series-wound, 4-pole, Bendix type drive starter motor which is mounted to drive the ring gear on the flywheel. The starter motor consists of the commutator head, frame and field, armature, drive and pinion housing.

*b. Removal.* Refer to figure 4-9.

(1) Remove engine housing side doors. Disconnect starter cable (1) as starter.

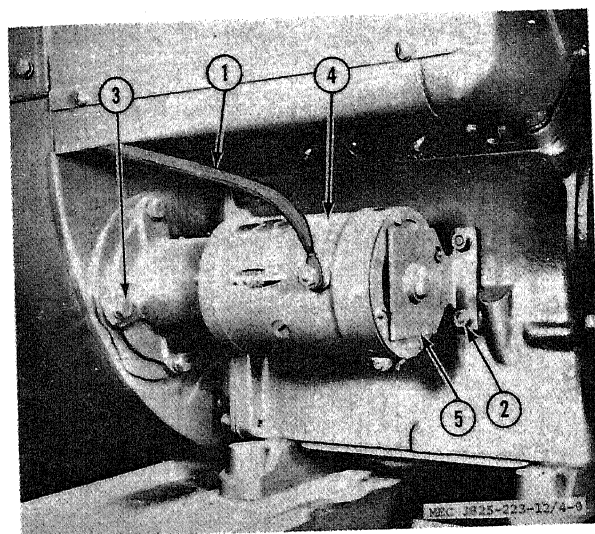
(2) Remove nut (2), lockwasher, bolt (3), lockwasher and starter (4).

*c. Replacement of Brushes.* Refer to figure 4-10.

- (1) Remove starter.
- (2) Loosen screw and remove cover band (1).
- (3) Remove brushes (2 and 3) from brushholder (4) and install new brushes.
- (4) Install cover band and tighten screw.
- (5) Install starter.

*d. Testing of Starter.* Refer to figure 4-11.

(1) *Load test.* Connect a voltmeter (1, fig. 4-11), knife switch (2), ammeter (3), variable resistor (4) and a 24-volt power source to starter



1. Starter cable
2. Nut
3. Bolt
4. Starter
5. Bracket

Figure 4-9. Starter removal.

motor. Attach a spanner wrench (5) to the drive pinion (6). Hang a scale (7) from support strong



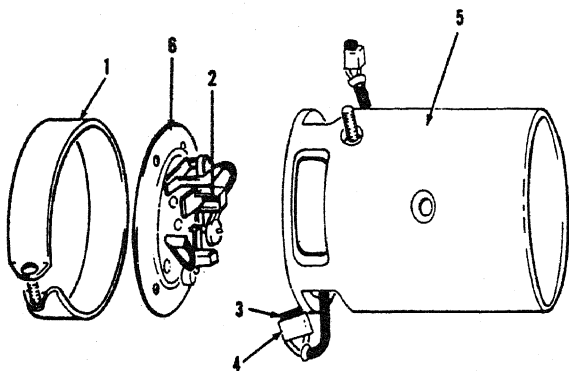
**Caution.** Always connect highest range of ammeter into circuit for initial test because the heavy current encountered when a shorted or grounded field exists, or when a shorted or grounded armature exists.

(2) *No-load tests.* Remove the scale and spanner wrench (5). Close the knife switch (2) and note the readings on the ammeter (3) and voltmeter (1). The no-load test readings must be 10 volts and 2,700 rpm minimum armature speed. If the starting motor does not test as specified, it must be repaired.

*e. Installation of Starter.*

(1) Position bracket (5, fig. 4-9) on starter and install in position on block using bolts (3), nuts (2) and lockwashers.

(2) Connect starter cable (1) and install doors.



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- |               |                |
|---------------|----------------|
| 1. Cover band | 4. Brushholder |
| 2. Brush      | 5. Housing     |
| 3. Brush      | 6. Plate       |

Figure 4-10. Brush replacement.

#### 4-34. Magneto

*a. Description.* The engine magneto assembly provides the high voltage electrical current for the engine ignition system. It is radio shielded and is driven off the timing gears at camshaft speed. The magneto is enclosed in a metal frame, cap and end cover. Threaded cable outlets are provided for connection to the spark plug lead shielding. All the interior metal is inter-

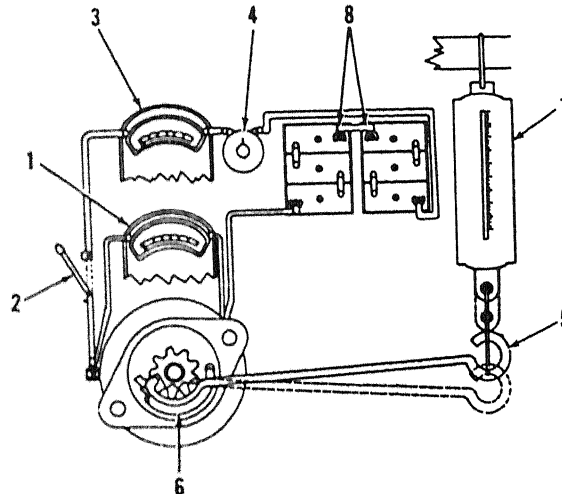
connected and grounded to provide radio shielding. The magneto armature is a one-piece magneto rotor that rotates between the pole pieces of a laminated iron frame causing an induced current to flow in the primary circuit of the coil during the time the contact points are closed. When the points open, the primary circuit is broken, instantly collapsing the field and inducing the secondary circuit of the coil to produce the intense ignition spark for startings. An impulse coupling is provided, which makes possible the production of a spark at cranking speed equal to that produced when the engine is running. The impulse consists of a hub and shell connected by a torsion type spring. Through this device, the magneto armature is held back while the engine is turned over to just past top dead center, at which instant the pawls of the coupling are released by the pawl stop pin causing the power coil spring to snap the magneto armature forward at high speed. This produces an intense spark, automatically retarded to prevent kick-backs. When the engine starts, the pawls are disengaged by centrifugal action of the drive gear, causing the coupling to act as a direct drive.

*b. Removal.* Refer to figure 4-12.

- (1) Remove the spark plug cables (1) from the magneto.
- (2) Remove the magneto stop switch wire (2).
- (3) Remove the high temperature safety switch by removing the terminal screw (3).
- (4) Remove the holddown bolt (4).
- (5) Remove the adjusting bolt and remove the magneto from its mounting.

*c. Installation.* Refer to figure 4-13.

- (1) Remove the screen from the flywheel air intake opening to expose the timing marks on the flywheel and shroud.
- (2) Turn the engine over with the hand crank until the leading edge of the flywheel vane marked with an "X" is in line with the vertical centerline which is marked on the shroud.
- (3) Remove the inspection plug from the timing gear housing. Install the magneto into the timing gear housing so that the "X" marked tooth on the magneto drive gear is visible through the lower half of the inspection hole. Install bolts.
- (4) Install inspection plug and flywheel screen.
- (5) Connect magneto stop switch wire to capacitor. Connect ground strap to terminal stud.
- (6) Connect spark plug cables.



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- |              |                 |
|--------------|-----------------|
| 1. Voltmeter | 5. Wrench       |
| 2. Switch    | 6. Drive pinion |
| 3. Ammeter   | 7. Scale        |
| 4. Resistor  | 8. Batteries    |

Figure 4-11. Starter testing.

*d. Adjustment.* Refer to figure 4-14.

- (1) Remove screw and lockwasher securing the magneto stop switch wire.
- (2) Remove the four connectors securing the spark plug cables and disconnect the cables, tagging each so they can be replaced in their proper sockets in the magneto.
- (3) Remove the four screws and lockwashers securing the end cover and remove the end cover and gasket.
- (4) Rotate the crankshaft with the starting crank until the breaker arm is riding on the high spot of the camshaft and the breaker points are wide open.
- (5) Loosen the locking screws (1) on the contact plate so that the plate is movable.
- (6) Insert the end of a small screwdriver into the adjusting slot at the bottom of the contact plate (2) and open or close the breaker points by moving the contact plate until the clearance is .015 checked with a feeler gauge.
- (7) Tighten the locking screws and recheck the breaker point gap to make sure it has not changed.
- (8) Position gasket and end cover on the magneto and secure with four lockwashers and screws.
- (9) Insert the spark plug cables into the

magneto sockets and secure with four connectors.  
(10) Position the magneto stop switch wire terminal on the magneto capacitor terminal and secure with lockwasher and screw.

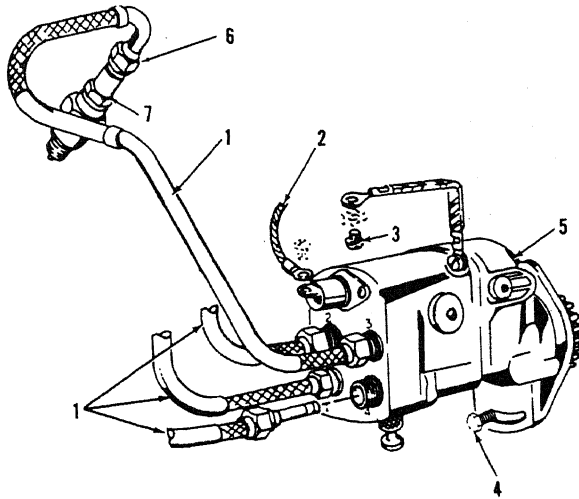
## 4-35. Spark Plugs

### a. Removal.

- (1) Unscrew the four connectors (fig. 4-12) holding the spark plug cables to the spark plugs and remove the cables.
- (2) Blow out the spark plug wells with compressed air.
- (3) Remove the spark plugs with a spark plug wrench and lift out the plug gaskets.
- (4) Plug the four spark plug holes with cork or wooden plugs, to prevent dirt from entering the cylinders.

### b. Cleaning and Inspection.

- (1) Clean the outside of the spark plugs with dry cleaning solvent (Federal Specification P-D-680).
- (2) Inspect the terminal socket for corrosion. Clean with wire brush.
- (3) Inspect the insulators for lead, carbon deposits and cracks. Clean all deposits from the insulators and use a brush to clean the threads. Replace any plugs with cracked insulators.



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- |          |                    |
|----------|--------------------|
| 1. Cable | 5. Magneto         |
| 2. Wire  | 6. Cable connector |
| 3. Screw | 7. Spark plug      |
| 4. Bolt  |                    |

Figure 4-12. Magneto removal.

(4) Examine the spark plug electrodes for pitting. Replace a badly pitted spark plug.

(5) If the center electrodes are not excessively worn file them level with a spark plug file.

(6) Adjust the spark plug gap to 0.030 of an inch by bending the ground, or flat electrode.

**Caution.** Do not bend the center electrode. To do so will break the insulation, rendering the spark plug inoperative.

*c. Installation.*

(1) Remove the cork or wooden plugs from the spark plug holes in the cylinder head.

(2) Position the spark plug gasket over each spark plug and install the plugs in the cylinder head.

(3) Use a spark plug socket and a torque wrench to tighten the spark plugs to a torque of from 25 to 30 foot-pounds.

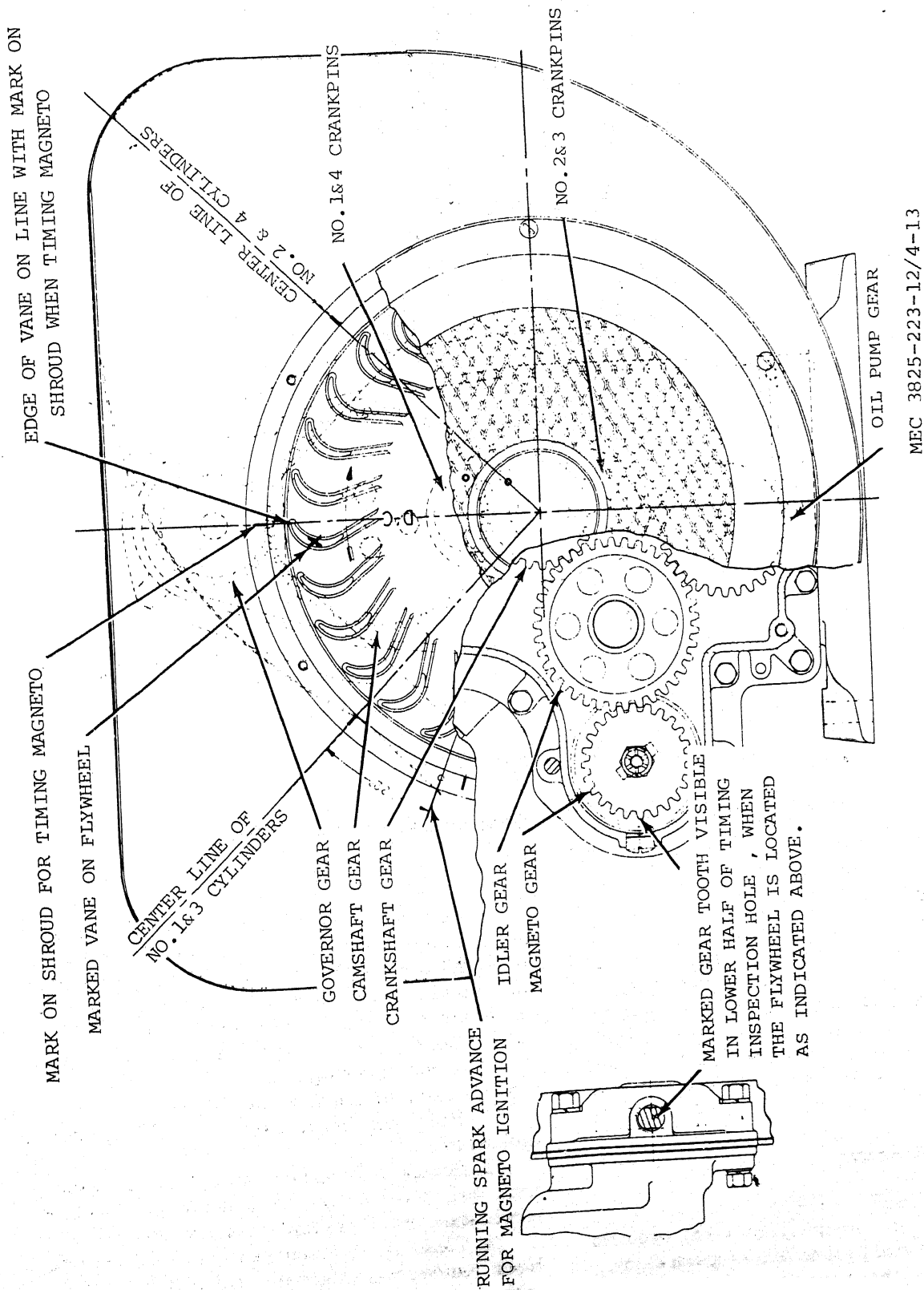
(4) Insert the spark plug cable terminals into the spark plug sockets and secure the connectors.

#### 4-36. Cables and Conductors

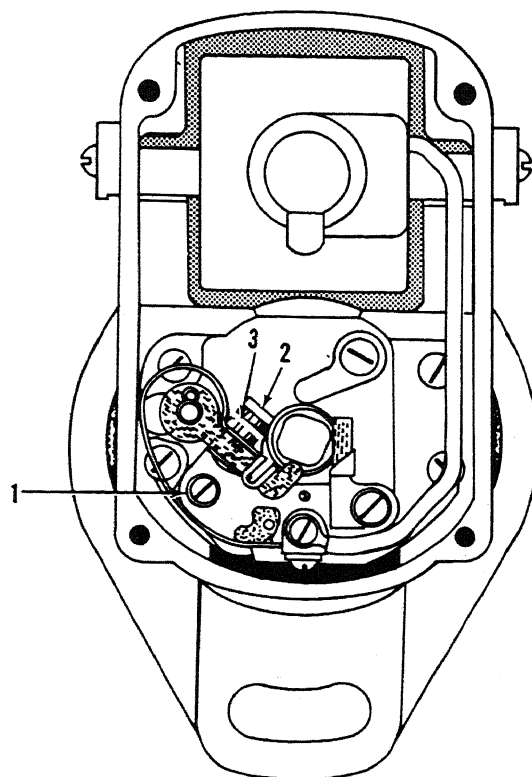
*a. General.* Cables and conductors may be cleaned and inspected without removing them from the engine. Clean each cable with cleaning solvent (Federal Specification P-D-680) and dry thoroughly. Inspect insulated cables for cracked or deteriorated insulation. Inspect conductors for breaks or frayed strands. Repair or replace defective cables or conductors.

*b. Spark Plug Cables.* Check for a broken cable by disconnecting all the spark plug cables and individually checking each cable by holding the end of each cable about 1/16 inch from the flywheel housing as the engine is cranked.

**Caution.** Hold the cable by the connector only. Do not touch the terminal or a shock will result. Do not perform this test if gasoline fumes are present.



**Figure 4-13. Magneto installation.**



MEC 3825-223-12/4-14

- |                  |                      |
|------------------|----------------------|
| 1. Screw         | 3. Breaker point gap |
| 2. Contact plate |                      |

Figure 4-14. Breaker point adjustment.

## Section XI. MAINTENANCE OF ENGINE CYLINDER HEADS AND VALVES

### 4-37. General

The pumping unit engine is equipped with L-type cylinder heads. It is secured to the cylinders with seventeen capscrews of various lengths. The cylinder head must be removed to inspect the cylinder bore. The valves are mounted in the cylinders and operated by a camshaft in the block.

### 4-38. Cylinder Heads

(4) Remove the seventeen capscrews (1 and 2) and plain washers (3) securing the cylinder head and remove the cylinder head (4). Remove the cylinder head gasket (5). Repeat the same procedure to remove the left cylinder head.

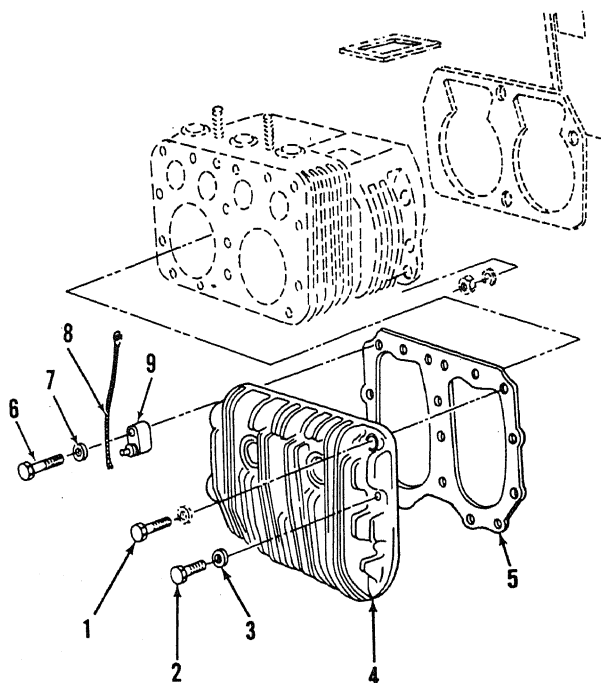
(5) Stuff rags in the cylinder bores to prevent dirt from entering.

#### b. Cleaning, Inspection and Repair.

(1) Brush all debris from the cylinder head cooling fins.

(2) Scrape all carbon and gasket residue from both the cylinder head and cylinder block, combustion chambers and gasket surfaces.

(3) Clean the cylinder head and the cylinder block combustion chamber and gasket surfaces with an approved cleaning solvent (Federal Specification P-D-680). Dry thoroughly with compressed air.



MEC 3825-223-12/4-15

- |                  |           |
|------------------|-----------|
| 1. Screw         | 6. Screw  |
| 2. Screw         | 7. Washer |
| 3. Washer        | 8. Wire   |
| 4. Cylinder head | 9. Switch |
| 5. Gasket        |           |

Figure 4-15. Cylinder head removal.

(4) Clean the capscrew threads with a wire brush and coat them lightly with OE 20.

(5) Inspect the cylinder heads for warpage with a straightedge.

(6) Inspect the cylinder heads for cracks, broken fins and damaged gasket surfaces. Replace a damaged or warped cylinder head.

#### c. Installation.

(1) Remove the rags from the cylinder bores. Wipe the bores with an oiled rag to make sure all dirt has been removed.

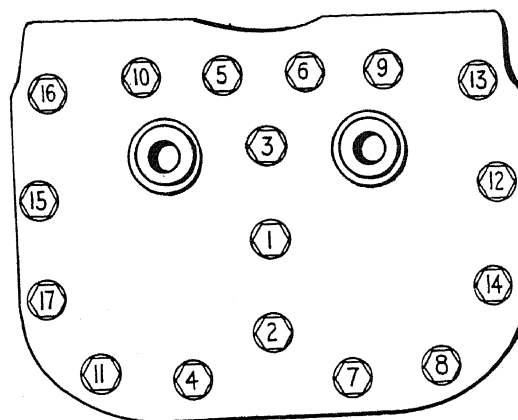
(2) Coat a new cylinder head gasket (5) lightly with OE 30 and position it on the cylinder block.

(3) Position the cylinder head (4) on the gasket (5) and secure with seventeen plain washers (3) and capscrews (1 and 2). Torque cylinder head capscrews to 22 to 24 foot-pounds in sequence (fig. 4-16). Use the same procedure to install the opposite cylinder head.

(4) Install the spark plugs (para 4-35).

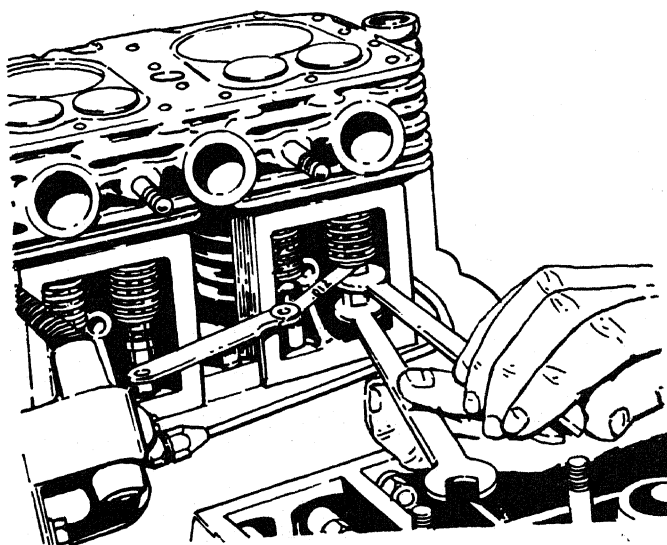
(5) Install the high temperature safety switch (para 4-22).

(6) Install the cylinder head heat deflectors and shrouding (para 4-19).



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Figure 4-16. Cylinder head screw tightening sequence.



MEC 3825-223-12/4-17

Figure 4-17. Valve tappet adjustment.

(7) Install the canopy (para 4-18).

## 4-39. Valve Tappet Adjustment

- Remove the canopy (para 4-18).
- Remove the manifolds (para 4-30).

Remove the cylinder head shrouding (para 9).

Remove the valve covers.

With the engine cold, turn the engine over with the crank until the valve is closed; then continue turning one-half turn to be sure that the tappet is not riding on the side of the cam.

*Note.* The engine must be cold when performing this adjustment or the clearances will not be correct.

f. Using a standard feeler gauge and tappet wrenches, set the intake valve clearances to .008 of an inch and exhaust valve clearances to .016 of an inch. Refer to figure 4-17.

g. Replace the valve covers, cylinder head shrouding (para 4-19), manifolds (para 4-30) and canopy (para 4-18).

## Section XII. MAINTENANCE OF WATER DISTRIBUTOR PIPING

### 40. General

a. *Water Lines.* The water lines consist of the rubber and metal pipes, fittings, and adapters which transport the water to the spraybars. It consists basically of a suction line, a by-pass line and discharge lines.

b. *Valves.* There are six valves in the water distributor piping. The inlet valve is located in the suction line of the pump to stop the flow of water to the pump from the water tank. This valve is closed when water is drawn from another source. The by-pass valve is located in the by-pass line from the discharge line to the water tank. This valve is closed when water is to be pumped to the spraybar. One valve is located in the discharge line to each spraybar. These valves are closed to stop flow to the spraybar. The valve is located in the coupling for the spraybar extension. When the extension coupling is in the vertical position, water is prevented from flowing to the extension.

### 41. Inlet Valve and Piping

a. *Removal.* Refer to figure 4-18.

(1) Drain water tank (para 2-14).

(2) Remove clamps (1) and pull suction line from rubber hose. Remove elbow (2), nipple (3), valve (4) and nipple (5) from tee (6).

b. *Cleaning, Inspection and Repair.*

(1) Clean all metal piping in dry cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

(2) Clean all pipe threads with a wire brush.

(3) Inspect piping, elbow and valve for cracks, breaks, corrosion or damaged threads. Replace as necessary.

(4) Inspect hose clamps and rubber connectors for damage or deterioration. Replace as necessary.

c. *Installation.*

*Note.* Coat all pipe threads with sealing compound (Federal Specification TT-A-580) before installing piping.

(1) Install nipple (5), valve (4), nipple (3) and elbow (2).

(2) Insert elbow into rubber hose and install clamp (1).

### 4-42. Spraybar Valves and Piping

a. *Removal.* Refer to figure 4-18.

(1) Remove clamps (7 and 8), remove nut, lockwasher and U-bolt (9).

(2) Lower piping and remove elbow (10), pipe (11), spraybar valves (12), and nipple (13) from tee (14).

b. *Cleaning, Inspection and Repair.*

(1) Clean all piping in cleaning solvent, Federal Specification P-D-680.

(2) Clean all pipe threads with a wire brush.

(3) Inspect piping, elbow and valves for cracks, breaks, corrosion or damaged threads. Replace as necessary.

(4) Inspect hose clamps and rubber connectors for damage or deterioration. Replace as necessary.

c. *Installation.*

(1) Install nipple (13), spraybar valves (12), pipe (11) and elbow (10) in tee (14).

(2) Lift pipe assembly and connect with rubber hose. Secure pipe to frame with U-bolt (9), lockwasher and nut. Install clamps (7 and 8).

### 4-43. By-Pass Valve and Piping

a. *Removal.* Refer to figure 4-18.

(1) Remove spraybar valves and piping (para 4-42).

(2) Unscrew and remove tee (14), nipple (15), tee (16) and nipple (17).

(3) Remove clamp (18) and pull pipe with valve from hose. Remove nipple (19) and valve (20) from pipe (21).

*b. Cleaning, Inspection and Repair.*

(1) Clean all piping in cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

(2) Clean all pipe threads with a wire brush.

(3) Inspect piping, elbow and valve for cracks, breaks, corrosion or damaged threads. Replace as necessary.

(4) Inspect hose clamps and rubber connectors for damage or deterioration. Replace as necessary.

*c. Installation.*

(1) Assemble valve (20) and nipple (19) to pipe (21). Insert pipe assembly into rubber hose and install clamp (18).

(2) Install tee (16), nipple (15), nipple (17) and tee (14).

(3) Install spraybar valves and piping (para 4-42).

#### 4-44. Spraybar and Piping

*a. Removal.* Refer to figure 4-19.

(1) Remove setscrew (1) and shear pin (2), unscrew spraybar (3).

(2) Remove spraybar extensions (4) by actuating the cam locking mechanism.

(3) Remove coupler (5), remove nuts (6) and remove pivot valve body (7), remove pivot valve spool (8).

(4) Unscrew and remove side outlet elbow (9), nipple (10) and hose swivel (11).

(5) Remove clamp (12) and disconnect hose (13), remove nipple (14), "Y" fitting (15) and support pipe (16).

*b. Cleaning, Inspection and Repair.*

(1) Clean all piping in cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

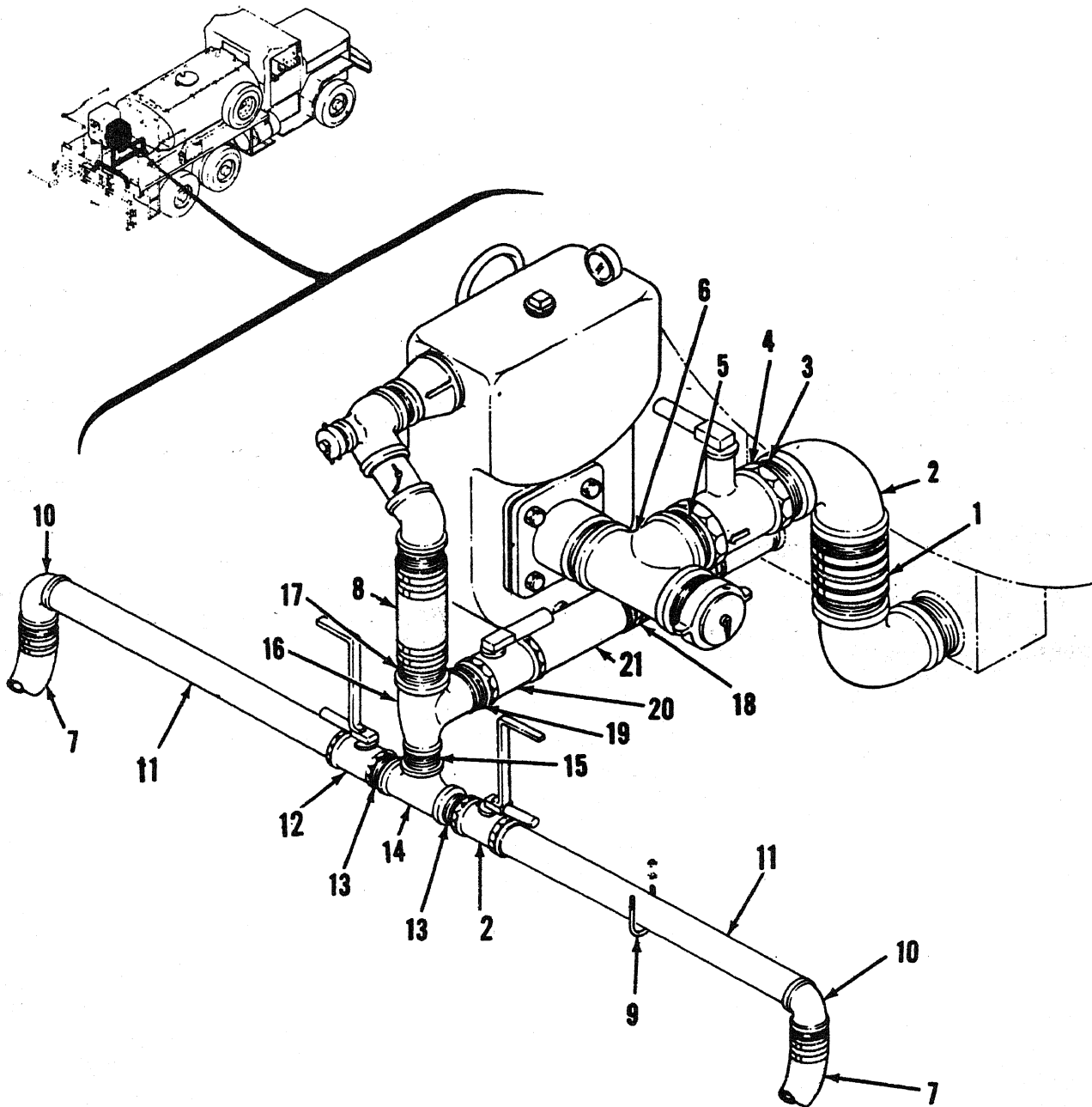
(2) Clean all pipe threads with a wire brush.

(3) Inspect piping, elbow and valve for cracks, breaks, corrosion or damaged threads. Replace as necessary.

(4) Inspect hose clamps and rubber connectors for damage or deterioration. Replace as necessary.

*c. Installation.* Reassemble and install the spraybar and piping in the reverse order of disassembly. Coat all pipe threads with sealing compound (Federal Specification TT-A-580).



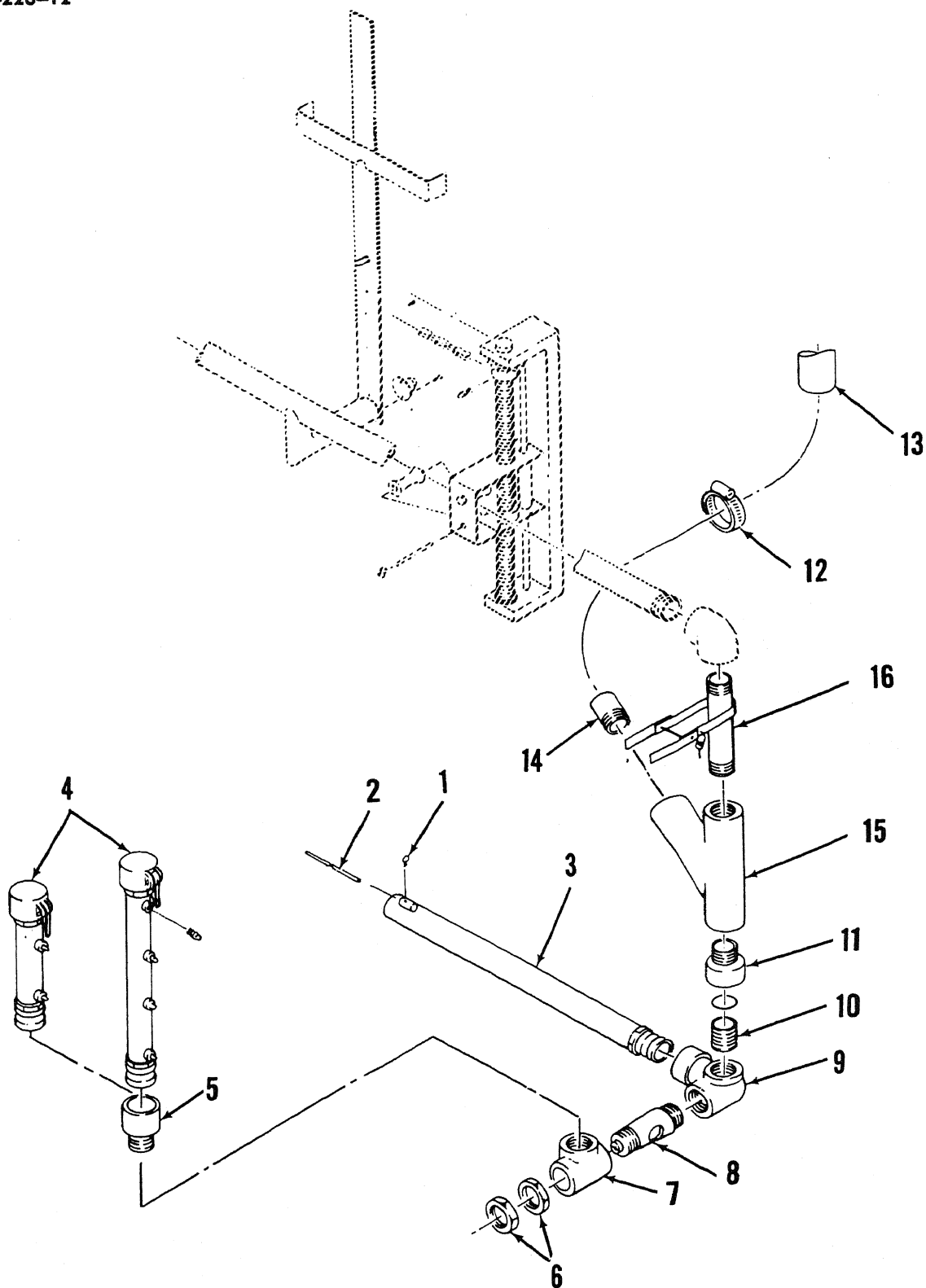


MEC 3825-223-12/4-18

Figure 4-18. Distribution piping.

- |                |                     |
|----------------|---------------------|
| 1. Clamp       | 12. Spraybar valves |
| 2. Elbow       | 13. Nipple          |
| 3. Nipple      | 14. Tee             |
| 4. Inlet valve | 15. Nipple          |
| 5. Nipple      | 16. Tee             |
| 6. Tee         | 17. Nipple          |
| 7. Clamp       | 18. Clamp           |
| 8. Clamp       | 19. Nipple          |
| 9. U-bolt      | 20. By-pass valve   |
| 10. Elbow      | 21. Pipe            |
| 11. Pipe       |                     |

Figure 4-18—Continued.



MEC 3825-233-12/4-19

Figure 4-19. Spraybar and piping.

- |                |                 |
|----------------|-----------------|
| 1. Setscrew    | 9. Elbow        |
| 2. Shear pin   | 10. Nipple      |
| 3. Spraybar    | 11. Swivel      |
| 4. Extension   | 12. Clamp       |
| 5. Coupler     | 13. Hose        |
| 6. Nut         | 14. Nipple      |
| 7. Valve body  | 15. "Y" fitting |
| 8. Valve spool | 16. Pipe        |

Figure 4-19—Continued.

## Section XIII. MAINTENANCE OF CHASSIS ELECTRICAL SYSTEM

### 4-45. General

*a.* The chassis electrical system consists of two separate systems. One system operates the M61A2 Truck Chassis. This system is covered in TM 9-2320-211-20.

*b.* The second system covers the wiring and lights peculiar to the Water Distributor. This system is shown in figure 1-4. It consists of marker lights, identification light, turn signals and wiring.

### 4-46. Wiring Harness

#### *a. Removal.*

- (1) Separate connectors at rear of chassis.
- (2) Separate connectors at marker lamps, identification lamps and turn signals.
- (3) Release all plastic retainers from harnesses.

(4) Remove harnesses by pulling them through grommets in distributor frame.

#### *b. Cleaning, Inspection and Repair.*

(1) Clean the wiring harnesses with cleaning solvent (Federal Specification P-D-680).

(2) Inspect the insulation for chafing, breakage or deterioration. Replace a wiring harness with badly deteriorated or chafed insulation. Tape any places where minor damage has occurred.

(3) Clean all connectors and remove any corrosion present.

#### *c. Installation.*

(1) Thread the harnesses through the grommets in the distributor frame.

(2) Fasten harnesses in plastic retainers.

(3) Make connections to lamps.

(4) Make connections to carrier wiring at rear of chassis.

### 4-47. Turn Signal Switch

#### *a. Removal.*

- (1) Disconnect turn signal switch wires at

flasher unit.

(2) Loosen screw securing clamp securing turn signal switch mounting bracket to steering wheel post, and remove turn signal switch and wiring harness.

#### *b. Installation.*

(1) Position turn signal switch mounting bracket under holddown clamp on carrier steering wheel post and tighten screw.

(2) Connect turn signal switch wires at flasher unit terminals.

### 4-48. Turn Signal Lamps and Brackets

#### *a. Lamp Replacement.*

(1) Remove the four screws securing the lens to the lamp body and remove the lens.

(2) Remove the socket-type bulb from the receptacle by pushing in and turning counterclockwise.

(3) Install the bulb by inserting into the receptacle and pressing in while turning clockwise.

(4) Position the lens on the lamp body and secure with four phillips screws.

#### *b. Removal.*

(1) Disconnect the socket connectors behind the turn signal lamps tagging the wires to facilitate installation.

(2) Remove the nut securing the turn signal lamp and remove the turn signal lamp.

(3) Remove the two bolts and nuts securing the rear turn signal lamp bracket to the water distributor frame and remove the turn signal bracket. Repeat this procedure to remove the opposite turn signal bracket.

(4) Remove the four nuts, bolts, and lockwashers securing the front turn signal bracket to the carrier fender and remove the front turn signal bracket. Repeat this procedure to remove the opposite turn signal bracket.

#### *c. Disassembly.*

(1) Remove the lens; see *a.* above.

(2) Remove the screws securing the blackout

lamp in the rear turn signal bracket and remove the blackout lamp.

*d. Inspection, Cleaning and Repair.*

(1) Clean all parts in solvent (Federal Specification P-D-680).

(2) Wash the lens in warm soapy water and rinse. Polish the lens with a soft cloth.

(3) Brush all rust and corrosion from the mounting brackets.

(4) Inspect turn signal lens, lamp body and mounting bracket for damage. Repair or replace as necessary.

(5) Paint a rusted or corroded bracket.

*e. Assembly.*

(1) Position blackout lamp in rear turn signal bracket and secure with screws.

(2) Position lens on lamp body and secure with four phillips screws.

*f. Installation.*

(1) Position the rear turn signal bracket on the water distributor frame and secure with bolts and nuts. Repeat procedure to install opposite bracket.

(2) Position the turn signal lamp in the bracket and secure with nut. Repeat this procedure to install each turn signal lamp.

(3) Connect the electrical lead to the turn signal lamp with the socket connector. Repeat for each turn signal lamp.

#### 4-49. Marker Lamps, Top

*a. Lamp Replacement.*

(1) Remove the snapping securing the lens to the lamp body.

(2) Remove the socket-type bulb from the receptacle by pushing in and turning counter-clockwise.

(3) Install the bulb by inserting into the receptacle and pressing in while turning clockwise.

(4) Position the lens on the lamp body and secure with snapping.

*b. Removal.*

(1) The top marker lamp assembly is unrepairable and must be replaced as a unit if defective.

(2) Disconnect and tag the electrical lead from lamp assembly.

(3) Remove the four screws securing the lamp assembly to the water tank and remove the lamp assembly.

*c. Installation.*

(1) Position the lamp assembly on the water tank and secure with four screws.

(2) Connect the electrical lead to the lamp assembly.

#### 4-50. Marker Lamps, Frame

*a. Lamp Replacement.*

(1) Remove the two screws securing the lamp to the water tank frame. Remove the lamp frame and lens.

(2) Remove the socket-type bulb from the receptacle by pushing in and turning counter-clockwise.

(3) Install the bulb by inserting into the receptacle and pressing in while turning clockwise.

(4) Position the lens and frame against the body and secure with the two machine screws.

*b. Removal and Disassembly.*

(1) Disconnect and tag the electrical lead from the lamp.

(2) Remove the frame, lens, lens clips, lens gasket and the bulb.

(3) Remove the four nuts, lockwashers and the machine screws securing the back plate to the frame. Remove the back plate assembly and the body pad from the skirting.

*c. Cleaning, Inspection and Repair.*

(1) Clean all metal parts with cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

(2) Wash the lens with soap and warm water and rinse thoroughly. If the lens is not cracked or chipped, polish with a soft, lint-free cloth. Replace a cracked or chipped lens.

(3) Inspect the backplate and the frame for dents, corrosion, or other damage and replace if necessary.

(4) Check the socket for corrosion. Repair or replace as necessary.

(5) Inspect the electrical leads for cracked, frayed or oil-soaked insulation and replace if damaged.

(6) Check all hardware and replace any that is damaged.

*d. Reassembly and Installation.*

(1) Install the wire assembly in the front of the back plate with the rubber nipple over the wire assembly protruding from the rear of the back plate.

(2) With the body pad properly positioned secure the back plate to the frame with the four machine screws, lockwashers and nuts.

(3) Install the bulb, lens gasket, the lens and the body. See *a.* above.

(4) Connect the electrical leads to the marker lamp and remove the identification tags.

#### 4-51. Reflectors

*a. Removal.* Remove the screw securing the reflector to the water distributor.

*b. Cleaning and Inspection.*

(1) Clean all parts in cleaning solvent (Federal Specification P-D-680).

(2) Inspect for cracks, breaks, worn gasket,

or other damage and replace as necessary.

*c. Installation.* Position the reflector on the water distributor and secure with screw.

## Section XIV. MAINTENANCE OF DISTRIBUTOR CONTROLS AND INSTRUMENTS

### 4-52. General

The Water Distributor controls and instruments consist of a bitumeter assembly, water tank level gauge, water pump pressure gauge and a signal gong. Controls and instruments for operation of the engine are given in Section VIII. Controls and instruments for operation of the M61A2 are given in TM 9-2320-211-20.

### 4-53. Bitumeter Assembly

*a. Description.* The bitumeter assembly consists of a bitumeter drive, lift rod and special tachometer. The bitumeter drive consists of a rubber tired wheel which drives a right angle tachometer drive. The bitumeter drive is mounted by a pivot to the frame and is held above the ground in the transport position by a lift bar. The bitumeter is a tachometer which is calibrated to read speed in feet per minute. It is equipped with a recording meter which indicates cumulative feet traveled and a resetable meter which records distance per trip. The bitumeter is driven by a flexible metal cable.

*b. Removal.* Refer to figure 4-20.

(1) Loosen nut (1) and disconnect bitumeter drive cable at tachometer drive head. Remove cotter pin (2), washer and disconnect lift rod (3) from bitumeter drive frame.

(2) Remove three bolts, nuts, and lockwashers securing bitumeter wheel mounting bracket (4) to carrier frame and remove bitumeter wheel assembly.

(3) Loosen nut (5) securing tachometer drive cable to tachometer head and pull tachometer drive cable through the floor of the carrier.

(4) Remove the two screws and lockwashers securing tachometer head to carrier instrument panel and remove tachometer head.

(5) Pull tachometer drive cable from its conduit.

*c. Disassembly.*

(1) Remove nut (6) securing bolt (7) in mounting bracket (4). Remove bolt and remove bitumeter frame (8) and wheel assembly from mounting bracket (4).

(2) Remove setscrew (9) and remove drive unit (10).

(3) Remove setscrew (11) securing wheel assembly (12).

(4) Remove the four nuts, bolts, and lockwashers securing the bearing support to the bitumeter frame.

(5) Remove the tire (14).

(6) Remove three bolts, nuts and lockwashers securing lift rod bracket and remove lift rod bracket (15).

*d. Cleaning, Inspection and Repair.*

(1) Clean all parts with cleaning solvent (Federal Specification P-D-680).

(2) Inspect frame and mounting brackets for bends, cracks, corrosion, and broken weldments. Repair or replace as necessary.

(3) Inspect bitumeter drive cable drive head, and tachometer head for damage. Repair or replace as necessary.

(4) Inspect the outside of the tire for checking and cracking.

(5) Inspect all hardware and spring for damage. Repair or replace as necessary.

*e. Assembly.*

(1) Install the tire.

(2) Install the bearing supports on the frame.

(3) Insert the axle shaft into the bearing.

(4) Secure the wheel assembly with setscrew.

(5) Position the tachometer drive assembly on bracket and secure with setscrew.

(6) Position bitumeter frame in mounting bracket, install bolt and secure with washer and nut.

*f. Installation.*

(1) Install tachometer drive cable in its conduit.

(2) Position tachometer head on instrument panel and secure with two screws and lockwashers.

(3) Thread tachometer drive cable through floorboard of carrier.

(4) Position bitumeter wheel mounting bracket on carrier frame and secure with three bolts, nuts, and lockwashers.

(5) Connect tachometer drive cable to tachometer unit with nut and to tachometer drive head.

(6) Position bitumeter lift rod in drive frame and secure with pin and washer.

(7) Install lift rod bracket with three bolts, nuts and lockwashers.

#### 4-54. Water Tank Level Gauge

*a. Description.* The water tank level gauge is mounted on the left rear of the water tank near the operator's position. This gauge is designed so that the operator may tell at a glance the approximate amount of water in the tank. This gauge is of simple construction and needs very little maintenance.

*b. Removal and Disassembly.* Refer to figure 4-21.

- (1) Drain water tank.
- (2) Remove screw (1), retainer (2) and gauge (3).
- (3) Remove screw (4) and bracket (5).
- (4) Remove screw (6) and float assembly (7).

*c. Cleaning, Inspection and Repair.*

(1) Clean all metal parts with cleaning solvent (Federal Specification P-D-680) and dry thoroughly.

(2) Inspect the retainer and dial for cracks or broken glass or other damage.

*d. Reassembly and Installation.*

(1) Insert float assembly (7) through water tank wall and secure with screws (6).

(2) Install bracket (5), screws (4), gauge (3), retainer (2) and screw (1).

*Note.* Indenture in gauge and key in bracket allow the gauge to be installed in only one position.

#### 4-55. Signal Gong

*a. Removal.*

(1) Disconnect signal gong, pull cords from signal gong.

(2) Remove four screws and nuts securing signal gongs to bracket and remove signal gongs.

*b. Disassembly.*

(1) Remove the acorn nut securing bell to the bracket and remove the bell.

(2) Detach the spring from the bracket and the gong arm and remove the spring.

(3) Detach spring from bracket and gong arm and remove the spring.

*c. Cleaning, Inspection and Repair.*

(1) Clean all parts with cleaning solvent (Federal Specification P-D-680).

(2) Check the bell for cracks and replace if necessary.

(3) Check the gong arm and lever for freedom of movement of the pivot points and replace the complete assembly if it is defective.

(4) Check the tension of the springs and replace when necessary.

(5) Replace frayed or otherwise defective cables.

*d. Reassembly.*

(1) Install spring on the bracket and the gong arm.

(2) Install spring on bracket and gong arm.

(3) Position the bell on the bracket and secure with acorn nut.

*e. Installation.*

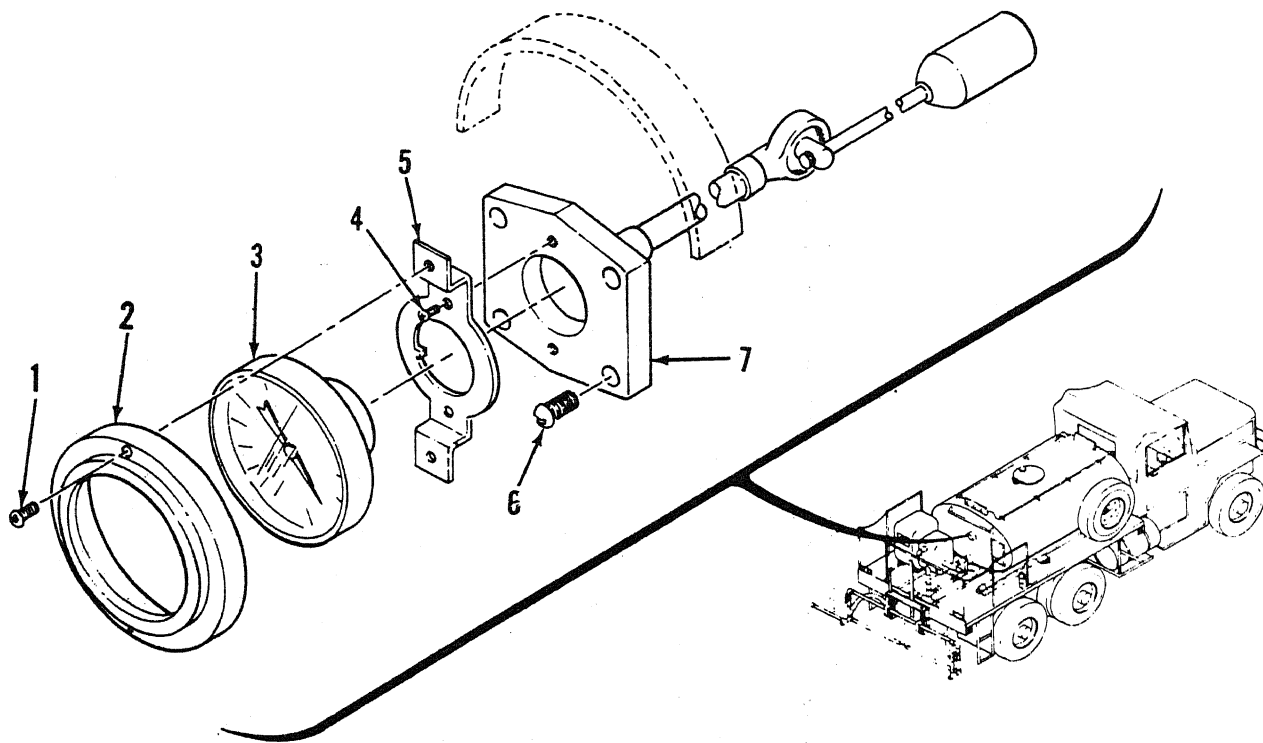
(1) Position gongs on brackets and secure with four screws and nuts.

(2) Connect pull cords.

9. Setscrew
10. Drive unit
11. Setscrew
12. Wheel assembly
13. Bolt
14. Tire
15. Bracket

**4-33**





MEC 3825-223-12/4-21

- 1. Screw
- 2. Retainer
- 3. Gauge
- 4. Screw

- 5. Bracket
- 6. Screw
- 7. Float assembly

*Figure 4-21. Water level gauge.*

## Section XV. MAINTENANCE OF WATER TANK AND FRAME ASSEMBLY

### 4-56. Manhole Cover

*a. Description.* The water distributor tank is equipped with a 20-inch diameter manhole cover for filling and inspecting the tank. The tank vent is located on the manhole cover. The manhole cover is hinged at the front and is secured at the rear by a 6-inch crank screwed onto a bolt hinged to the outside of the manhole.

*b. Manhole Cover, Removal and Disassembly.*

(1) Open manhole cover by unscrewing crank.

(2) Remove hing bolts at front and rear of manhole.

*c. Manhole Cover Cleaning and Inspection.*

(1) Clean machined parts.

(2) Inspect threads and replace or repair defective parts.

(3) Inspect manhole cover gasket and replace if defective.

*d. Manhole Cover Installation.*

(1) Position manhole cover hinge bushing in bracket at front of manhole and install hinge bolt.

(2) Position crank bolt in bracket at rear of manhole and install hinge bolt.

### 4-57. Spraybar Takeup Assembly

*a. Description.* The spraybar takeup assembly provides for the vertical adjustment of the spraybar position by means of two jack screws operated by a crank and connected by a roller chain meshed with a sprocket on each screw. In addition, the spraybar takeup assembly permits lateral adjustment of the spraybar position by providing rollers which support the spraybar assembly.

*b. Removal.* Refer to figure 4-22.

(1) Remove spray-bar assembly (para 4-44).

(2) Remove roller chain from sprockets by removing connecting link.

(3) Remove left and right spraybar takeup bracket from distributor by removing two bolts and nuts holding each bracket.

*c. Disassembly.*

(1) Remove pipe rolls from pipe roll frame

by prying retainers off ends of pipe roll shafts.

(2) Do not remove jack screw from assembly because the top bearing in the spraybar takeup bracket is pressed in the bracket.

*d. Cleaning, Inspection and Repair.*

(1) Clean all parts in cleaning solvent (Federal Specification P-D-680).

(2) Inspect visually and by operating screw for damaged threads or bearings or bent screws.

(3) Repair or replace all damaged parts.

*e. Assembly.*

(1) Install pipe rolls in pipe roll frame by inserting shafts.

(2) Press retainers on ends of pipe roll shafts.

(3) Install takeup brackets on distributor by inserting two belts in each and secure with lockwashers and nuts.

(4) Adjust both pipe roll frames to same vertical position and install roller chain on sprockets and secure with connecting link.

(5) Install spraybar assembly.

### 4-58. Fender and Step Assembly

*a. Removal.*

(1) Remove two each nut, bolt, and lockwasher securing step stringer to distributor frame.

(2) Remove five each nut, bolt, and lockwasher securing fender to catwalk.

*b. Cleaning, Inspection and Repair.*

(1) Clean all parts in solvent, Federal Specification P-D-680.

(2) Brush off all rust and corrosion.

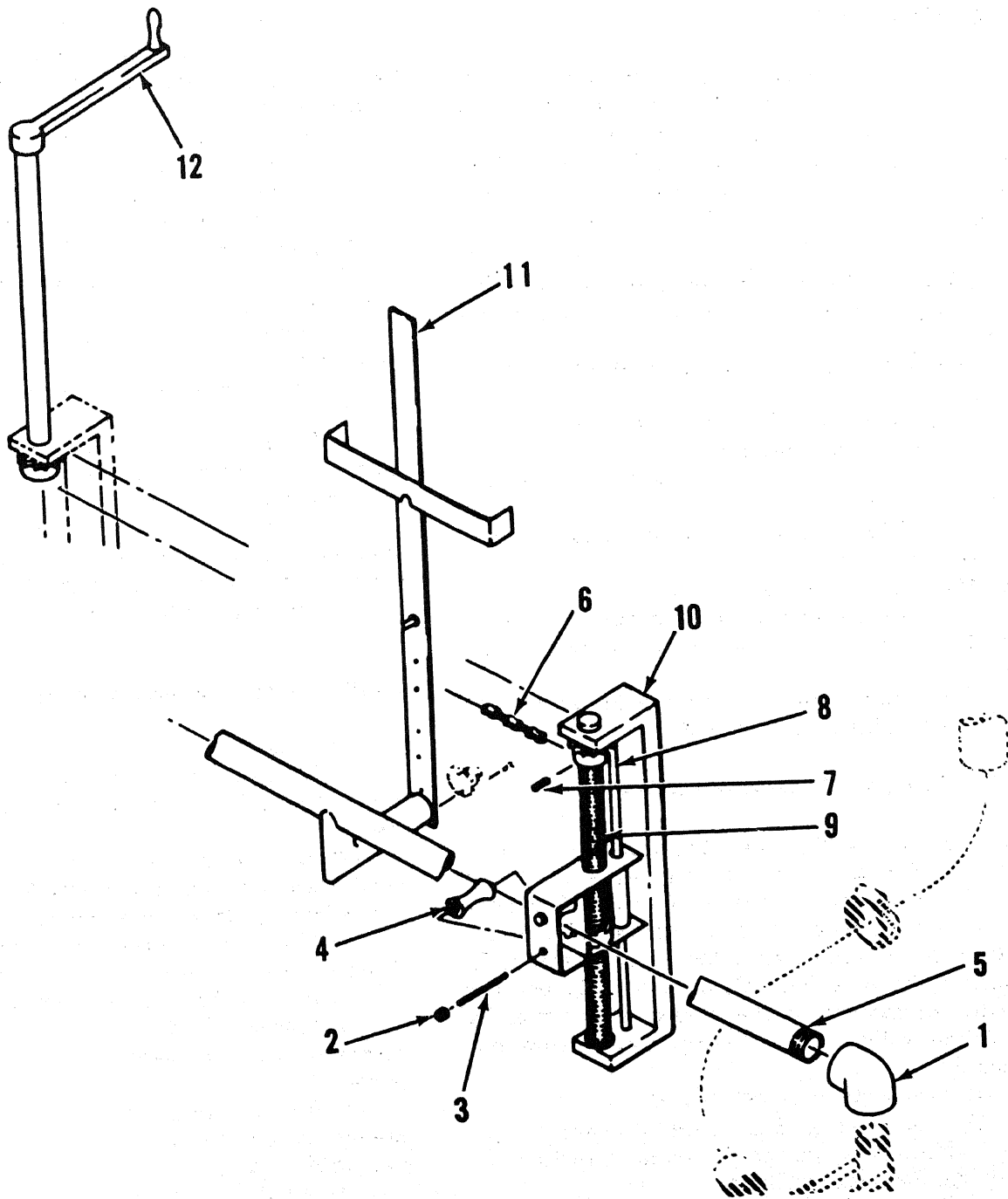
(3) Inspect fender for dents, bends or corrosion damage. Repair or replace damaged parts.

(4) Inspect steps and step stringer for breaks or weakened welds. Repair or replace damaged parts.

*c. Assembly.*

(1) Install fender by inserting five bolts in angle under catwalk. Secure with lockwashers and nuts.

(2) Fasten step stringer to rear of distributor frame and secure with lockwasher and nuts.



MEC 3825-223-12/4-22

Figure 4-22. Spraybar takeup assembly.

- |           |                              |
|-----------|------------------------------|
| 1. Elbow  | 7. Setscrew                  |
| 2. Nut    | 8. Sprocket                  |
| 3. Shaft  | 9. Screw                     |
| 4. Roller | 10. Frame                    |
| 5. Pipe   | 11. Lateral Adjustment lever |
| 6. Chain  | 12. Crank                    |

*Figure 4-22—Continued.*

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## APPENDIX A

### REFERENCES

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#### A-1. Fire Protection

TB 5-4200-200-10      Hand portable fire extinguisher for army use.

#### A-2. Lubrication

C9100IL      Fuels, lubricants, oils and waxes.  
LO 5-3825-223-12      Lubrication Order.  
LO 9-2320-211-12      Lubrication Order: M61Ax Truck Chassis.

#### A-3. Painting

TM 9-213      Painting Instructions for field use.

#### A-4. Radio Suppression

TM 11-483      Radio Interference Suppression.

#### A-5. Maintenance

TM 38-750      Army equipment record procedures.  
TM 9-2320-211-10      Operators Manual: for 5 ton, 6 x 6 Truck, Chassis M61A2.  
TM 9-2320-211-20      Organizational Maintenance Manual: for 5 ton, 6 x 6 Truck, Chassis M61A2.  
TM 9-2320-211-20P      Organizational Maintenance Repair Parts and Special Tools List for 5 ton, 6 x 6 Truck, Chassis, M61A2.

#### A-6. Shipment and Storage

TM 740-90-1      Administrative Storage of Equipment.

#### A-7. Destruction of Army Material

TM 750-244-3      Procedures for Destruction of Equipment to Prevent Enemy use (Mobility Eq. Command).



## APPENDIX B

### MAINTENANCE ALLOCATION CHART

#### Section I. INTRODUCTION

##### B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with assigned maintenance functions.

c. Section III. Not Applicable.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

##### B-2. Explanation of Columns in Section II

a. *Group Number, Column (1).* The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. *Functional Group, Column (2).* This column contains a brief description of the components of each functional group.

c. *Maintenance Functions, Column (3).* This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform those functions. The symbol designations for the various maintenance categories are as follows:

- C—Operator or crew
- O—Organizational maintenance
- F—Direct support maintenance
- H—General support maintenance
- D—Depot maintenance

The maintenance functions are defined as follows:

- A—*Inspect:* To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.
- B—*Test:* To verify serviceability and to detect electrical or mechanical failure by use of test equipment.
- C—*Service:* To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.
- D—*Adjust:* To rectify to the extent necessary to bring into proper operating range.
- E—*Align:* To adjust specified variable elements of an item to bring to optimum performance.
- F—*Calibrate:* To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.
- G—*Install:* To set up for use in an operational environment such as an emplacement, site, or vehicle.
- H—*Replace:* To replace unserviceable items with serviceable like items.
- I—*Repair:* Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.
- J—*Overhaul:* Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.
- K—*Rebuild:* The highest degree of material maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational conditions or other paramount factors and then the depot maintenance category. Rebuild zero the hours on the equipment. Rebuild the equipment to the original condition.

d. *Tools*  
column is  
special t



required to perform the maintenance functions (sec. II).

*e. Remarks, Column (5).* This column is provided for referencing by code the remarks (sec. IV) pertinent to the maintenance functions.

### B-3. Explanation of Columns in Section IV

a. *Reference Code.* This column consists of

two letters separated by a dash, both of which are references to section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

*b. Remarks.* This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, section II.

## Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions										(4) Tools and equipment	(5) Remarks	
		A	B	C	D	E	F	G	H	I	J			K
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul			Rebuild
01	ENGINE:													
0100	Engine Assembly:													
	Engine, gasoline	C	O	C					F	O	H			A-B
0101	Crankcase, Block													
	Cylinder Head:													
	Crankcase, block	O							H	H				
	Head	O							O					
0102	Crankshaft:													
	Crankshaft	H							H					
	Bearings	H							H					
	Seals	H							H					
0103	Flywheel Assembly:													
	Flywheel	O							O					
	Ring Gear	O							F					
0104	Pistons, Connecting													
	Rods:													
	Pistons	H							H					
	Rings	H							H					
	Pins	H							H					
	Retainers	H							H					
	Rods, Connecting	H							H					
0105	Valves, Camshaft,													
	Timing System:													
	Valves	F							F	F				
	Seats	F							F	F				
		F							F					
		F							F					
		F							F					
		F							F					
		F							F					

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
0106	Engine Lubrication System:													
	Pump, Oil	--	--	--	--	--	--	--	F					
	Pan, Oil	--	--	--	--	--	--	--	F					
	Filter, oil	--	--	C	--	--	--	--	O					
	Cap, breather	--	--	C	--	--	--	--	O					
	Tube, filler; fittings	O	--	O	--	--	--	--	O					
	Lines	--	--	--	--	--	--	--	O	O	--	--	-----	C-H
	Dipstick	C	--	--	--	--	--	--	O					
0107	Engine Starting System: (other than electric)													
	Crank	O	--	--	--	--	--	--	O					
0108	Manifolds:													
	Manifolds	O	--	--	--	--	--	--	O					
	Gaskets	O	--	--	--	--	--	--	O					
03	FUEL SYSTEM													
0301	Carburetor:													
	Carburetor	O	--	--	--	--	--	--	O					
	Gasket, bowl	O	--	--	--	--	--	--	O					
0302	Fuel Pump:													
	Pump, fuel	O	--	--	--	--	--	--	O					
0304	Air Cleaner:													
	Cleaner, Air	C	--	O	--	--	--	--	O					
0306	Tank, Lines, Fittings:													
	Tank, Fuel	O	--	--	--	--	--	--	O					
	Lines	O	--	--	--	--	--	--	O	O				
	Fittings, hose	O	--	--	--	--	--	--	O					
0308	Engine Speed Governor:													
	Governor	--	--	--	--	--	--	--	O	F				
	Controls	O	--	--	--	--	--	--	O					
0312	Throttle & Choke Controls:													
	Controls	O	--	--	--	--	--	--	O					
04	EXHAUST SYSTEM:													
0401	Muffler and Pipes:													
	Muffler	O	--	--	--	--	--	--	O					
	Pipes	O	--	--	--	--	--	--	O					
	Shield	O	--	--	--	--	--	--	O					
05	COOLING SYSTEM:													
0502	Cowling, Deflectors, Air Duct, Shroud, Etc.:													
	Shrouds	O	--	--	--	--	--	--	O					
	Deflectors	O	--	--	--	--	--	--	O					
	Screens	O	--	--	--	--	--	--	O					

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
06	ELECTRICAL SYSTEM:													
0603	Starting Motor:													
	Starter			O						O	F	H		
	Brushes	O							O					
0605	Ignition Components:													
	Magneto			O	O					O	F			
	Points				O				O					
	Condenser								O					
	Cables	O							O					
	Spark Plugs	O	O		O				O					
0606	Engine Safety Controls:													
	Switch, safety	O								O				
0607	Instrument or Engine Control Panel:													
	Switches	O	O							O				
	Wiring	O	F							O	O			
0609	Lights:													
	Tail lights									O	O			
	Marker Lights									O	O			
	Turn Signal Lights									O	O			
	Lamps			C						O				
	Lens	C								O				
	Gaskets	C								O				
0612	Battery, Storage, Wet:													
	Cables	O								O	O			
0613	Chassis Wiring Harness:													
	Harness, wiring	O								F	O			
0615	Radio Interference Suppression:													
	Components			O						O				
13	WHEELS AND TRACKS:													
1311	Wheel Assembly:													
	Wheel tachometer drive			C						O				
1313	Tires and Tubes													
	Tire			C						O				
	Tube									O	O			
15	FRAME													
1501	Frame Assembly:													
	Frame	O								H	F			
	Platforms	O								H	F			
	Catwalks	O								H	F			
	Ladders	O								H	F			
	Handrails	O								H	F			

(1) Group No.	(2) Functional group	(3) Maintenance functions										(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul		
1504	Spare Wheel Carrier & Tire Lock:												
	Bar, Mounting	C									O		
18	BODY, CAB, AND HOOD:												
1801	Body, Cab, Hood Assemblies:												
	Hood	C								O	F		
	Guard	C								O	F		
	Shield	C								O	F		
	Panels	C								O	F		
1808	Storage Racks & Boxes:												
	Box, tool									O	F		
1811	Tank Bodies												
	Tank, water	O								H	F		
22	BODY CHASSIS AND ACCESSORY ITEMS:												
2202	Accessory Items:												
	Accessories, Mounted	O								O			
2210	Data Plates and Instruction Holders:												
	Plates, data	O								O			
	Plates, Instruction	O								O			
47	GAGES (Nonelectrical):												
4701	Instruments, Speed and Distance:												
	Tachometer		F							F	H		
	Drives			O						O			
4702	Gages, Mountings, Lines and Fittings:												
	Gages, pressure	O								O			
	Indicator, water level	O								O			
55	PUMPS (Exclude Engine Pumps):												
5500	Pump Assembly:												
	Pump			O						F	F		
5501	Shafts, Impellers:												
	Impeller	F								F			
5505	Discharge System:												
	Valve, Check	F								F			
5510	Inlet & Outlet Compo- nents:												
	Valve, foot	O								O			
	Strainers			C						O			

825-223-12

(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
	A	B	C	D	E	F	G	H	I	J	K		
	Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
Fluid Lines:													
Pipes -----	O	--	--	--	--	--	--	O	F				
Fittings -----	O	--	--	--	--	--	--	O					
Hoses -----	O	--	--	--	--	--	--	O	F				
Valves -----	O	--	--	--	--	--	--	O	F				
Controls -----	O	--	--	--	--	--	--	O	F				
Spray bars -----	O	--	--	--	--	--	--	O					
Nozzles -----	O	--	--	--	--	--	--	O	F				
Extensions -----	O	--	--	--	--	--	--	O					

## Section IV. REMARKS

Reference Code	Remarks
A-B	Test includes engine operation and compression check
B-H	Camshaft removal is necessary
C-H	External lines

## APPENDIX C

### BASIC ISSUE ITEMS LIST

#### Section I. INTRODUCTION

##### C-1. Scope

This appendix lists items which accompany the Model 1602 Water Distributor or are required for installation, operation, or operator's maintenance.

##### C-2. General

This Basic Issue Items List is divided into the following sections:

*a. Basic Issue Items—Section II.* A list of items which accompany the Water Distributor and are required by the operator/crew for installation, operation, or maintenance.

*b. Maintenance and Operating Supplies—Section III.* A listing of maintenance and operating supplies required for initial operation.

##### C-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, section II.

*a. Source, Maintenance and Recoverability Codes (SMR), Column (1):*

(1) Source code, indicates the selection status and source for the listed item. Source code is:

Code	Explanation
P	Repair parts which are stocked in or supplied from the GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

*b. Federal Stock Number, Column (2).* This column indicates the Federal stock number

assigned to the item and will be used for requisitioning purposes.

*c. Description, Column (3).* This column indicates the Federal item name and any additional description of the item required. The abbreviation "w/e", when used as a part of the nomenclature, indicates the Federal stock number includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

*d. Unit of Measure (U/M), Column (4).* A two-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

*e. Quantity Incorporated in Unit, Column (5).* This column indicates the quantity of the item used in (the assembly group). A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g., shims, spacers, etc.)

*f. Quantity Furnished with Equipment, Column (6).* This column indicates the quantity of an item furnished with the equipment.

*g. Illustration, Column (7).* This column is divided as follows:

(1) *Figure Number, Column (7)(a).* Indicates the figure number of the illustration in which the item is shown.

(2) *Item Number, Column (7)(b).* Indicates the callout number used to reference the item in the illustration.

##### C-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies—Section III

*a. Component Application, Column (1).* This column identifies the component application of

ach maintenance or operating supply item.

b. *Federal Stock Number, Column (2).* This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. *Description, Column (3).* This column indicates the item name and brief description.

d. *Quantity Required for Initial Operation, Column (4).* This column indicates the quantity

of each maintenance or operating supply item required for initial operation of the equipment.

e. *Quantity Required for 8 Hours Operation, Column (5).* This column indicates the estimated quantities required for an average 8 hours of operation.

f. *Notes, Column (6).* This column indicates informative notes keyed to data appearing in a preceding column.

## Section II. BASIC ISSUE ITEMS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	
SMR code	Federal stock number	Description Ref No. & Mfr code	Usable on code	Unit of meas	Qty inc in unit	Qty furn with equip	Illustration (A) Fig No. (B) Item No.
BASIC ISSUE ITEMS, MANUFACTURER OR DEPOT INSTALLED							
PC	2540-796-1712	Bag, Pamphlet		Ea		1	
PC	7510-889-3494	Binder, Log Book		Ea		1	
PC	7520-559-9618	Case, Manuals		Ea		1	
PC		DA Technical Manual TM 5-3825-223-12		Ea		1	
PC		DA Technical Manual TM 9-2320-211-10		Ea		1	
PC	4210-889-2221	Extinguisher, Fire		Ea		1	
PC		DA Lubrication Order LO 5-3825-223-12		Ea		1	
PC		DA Lubrication Order LO 9-2320-211-12		Ea		1	
PC	4720-092-9265	Hose Assembly, 30 Ft Lg		Ea		1	
BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED							
PC	5140-772-4142	Bag, Tool, Canvas		Ea			
PC	5120-243-2419	Bar, Socket Handle		Ea			
PC	4910-204-2547	Inflator Gage		Ea			
PC	5120-072-0715	Jack, Hydraulic Hand		Ea			
PC	5120-223-7398	Pliers, Slip Joint		Ea			
PC	5120-222-8852	Screwdriver		Ea			
PC	5120-227-7338	Screwdriver		Ea			
PC	5120-234-8912	Screwdriver		Ea			
PC	5120-234-8913	Screwdriver		Ea			
PC	5120-264-3796	Wrench, Open End		Ea			
PC	5120-708-3302	Wrench, Plug		Ea			
PC	5120-316-9217	Wrench, Socket		Ea			

## Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required F/initial operation	(5) Quantity required F/8 hrs operation	(6) Notes
0101 Crankcase (1)		Oil Lubricating: 5 gal Pails as follows:			(1) Includes Quantity of oil to fill engine oil system as follows: 4 Qt—Crankcase 1 Qt—Oil Filter
	9150-265-9435(2)	OE-30	5 Qt		
	9150-265-9428(2)	OE-10	5 Qt		
	9150-242-7603(2)	OES	5 Qt		
0304 Cleaner (4)		Oil Lubricating (4)	1/2 Qt		(2) SEE FSC C9100-1L for additional data and re- quisition procedures.
0306 Fuel Tank	9130-160-1818	Fuel, Gasoline: Bulk as follows:			(3) See current LO for Grade, application and re- plenishment intervals.
		Automotive, Combat 91A	50 Gal		
	9130-160-1830	Automotive, Combat 91C	50 Gal		(4) Use oil as prescribed in Item 1.
Pipe & Thread Compound	8030-201-0996	Sealing Compound Spec FED-TT-A-580	1 Pt		





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By Order of the Secretary of the Army:

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*Chief of Staff.*

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